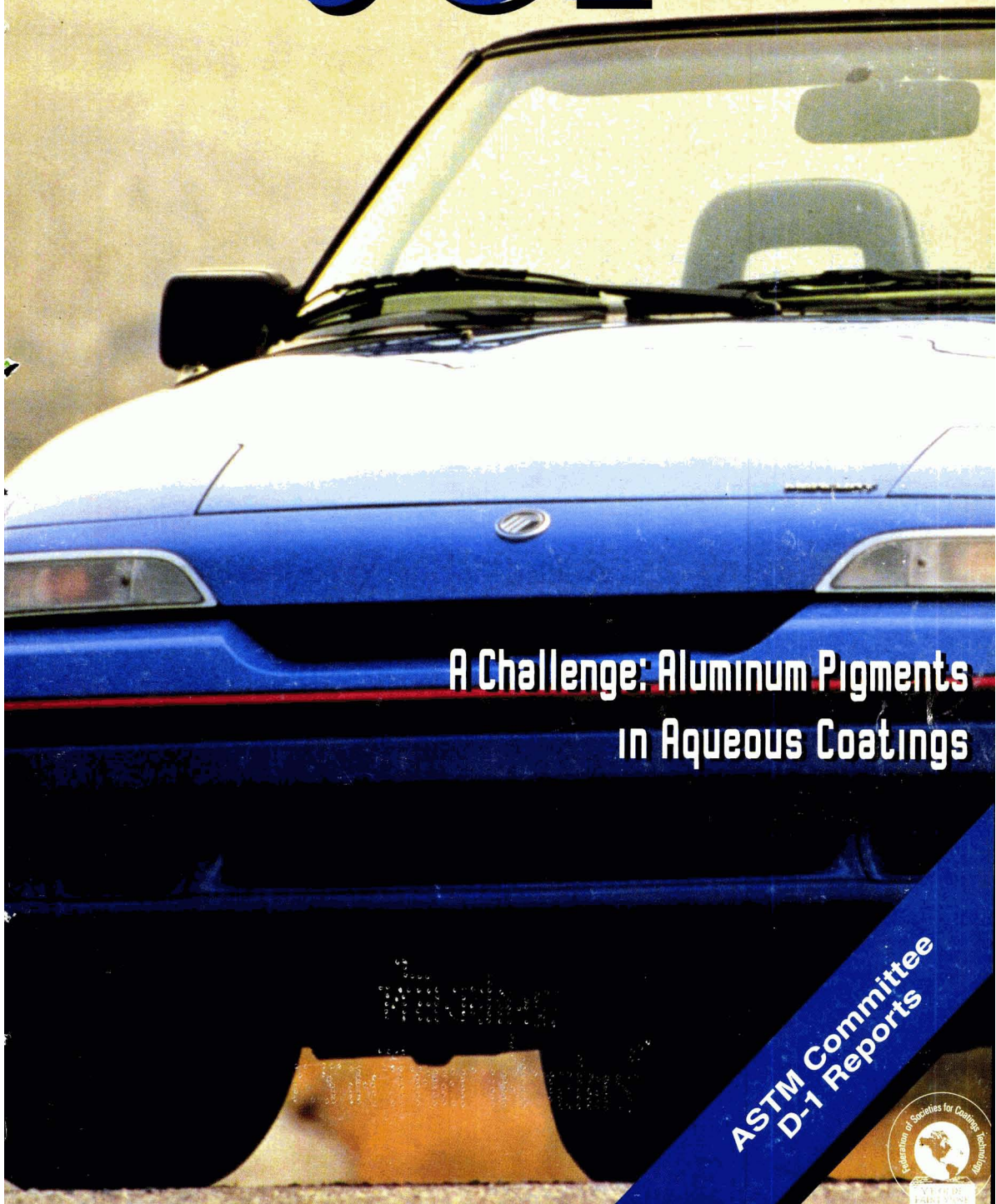


November 1996

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JOURNAL OF COATINGS TECHNOLOGY

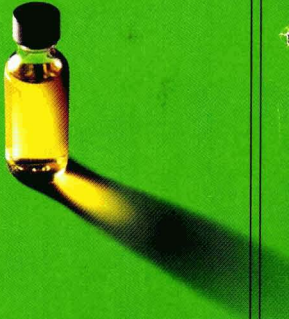


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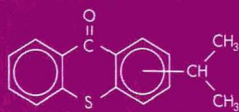
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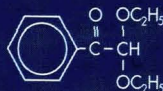
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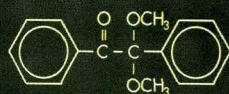
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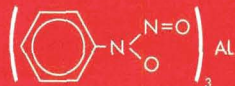
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Formulation and Production Forum

19 A Challenge: Aluminum Pigments in Aqueous Coatings—D.P. Chapman

Information is provided on new surface treated aluminum pigments for low VOC aqueous coatings with suggestions for achieving low gassing formulations.

Technical Articles

25 Characterization of Two-Stage Latexes Using Dynamic Mechanical Thermal Analysis—B. Rearick, S. Swarup, and P. Kamarchik

This manuscript deals with the characterization of two-stage polymerization of varying composition latexes by thermal mechanical analysis and particle sizing.

33 Aqueous Dispersions for Ultraviolet Light Curable Coatings—J. Wang, J.A. Arceneaux, and J. Hall

Aqueous dispersions of ultraviolet light curable resins have been prepared and evaluated. The physical and rheological properties of these dispersions have been determined and the performance of these dispersions in coating systems has been studied.

37 Factors Affecting Dirt Pickup in Latex Coatings—A. Smith and O. Wagner

The authors present some exposure data which relates dirt pickup and chalking to both film former and paint composition in latex paints.

43 Preparation of UV Curable Emulsions Using PEG-Modified Urethane Acrylates and Their Coating Properties—M.-E. Song, J.-Y. Kim, and K.-D. Suh

In this paper, PEG-modified urethane acrylates were synthesized by the reaction of poly(ethylene glycol), with residual isocyanate groups of a urethane acrylate.

Federation News

11 1996-97 FSCT Officers: Jay Austin, of Chicago Society, Elected 75th President of the Federation, at Annual Meeting in Chicago, IL

12 1996-97 FSCT Committee Chairs Appointed by President Austin

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Guide for Authors



GENERAL

The JOURNAL OF COATINGS TECHNOLOGY is published monthly by the Federation of Societies for Coatings Technology for its membership of approximately 7,000 in 26 Constituent Societies in the United States, Canada, Great Britain, and Mexico. The JOURNAL is devoted to the advancement of knowledge in the science and technology of surface coatings, the materials comprising such coatings, and their use and performance.

The Editors invite submission of original research papers, review papers, and papers under the special headings *Open Forum* and *Back to Basics*, and *Letters to the Editor*. All manuscripts will be assumed to be previously unpublished writing of the authors, not under consideration for publication elsewhere. When review papers contain tables or graphs from copyrighted articles, the authors will be required to obtain permission for use from the copyright holders. When the organization with which the authors are affiliated requires clearance of publications, authors are expected to obtain such clearance before submission of the manuscript. Papers presented to associations other than the Federation must be released by written communication before they can be considered for publication in the JOURNAL OF COATINGS TECHNOLOGY. Authors are obligated to reveal any exceptions to these conditions at the time a manuscript is submitted.

The JOURNAL OF COATINGS TECHNOLOGY has first right to the publication of papers presented at the International Coatings Technology Conference of the Federation and at local regional meetings or symposia of the Constituent Societies.

Papers in which proprietary products or processes are promoted for commercial purposes are specifically unacceptable for publication.

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...for the Journal

Four complete copies should be sent to the Editor, JOURNAL OF COATINGS TECHNOLOGY, 492 Norristown Rd., Blue Bell, PA 19422. The cover letter should address copyright, clearance, and release issues discussed above and should specify paper category: *Original Research*, *Reviews*, *Open Forum*, or *Back to Basics*.

Letters to the Editor: The JOURNAL will consider for publication all correspondence relevant to the coatings industry and to the contents of the JOURNAL. When a letter concerns an article appearing in the JOURNAL, the original author is usually given an opportunity to reply.

...by Constituent Societies For International Coatings Technology Conference Presentation

Ten complete copies of the manuscript are required for committee review. The set of copies should be addressed to Mike Bell, Director of Educational Services, FSCT, 492 Norristown Rd., Blue Bell, PA 19422.

...for Roon Foundation Award Competition

Ten complete copies of the manuscript are required, and should be submitted to Mike Bell at the address previously listed. (For complete details, see "Roon Awards" section of the JOURNAL in the January 1995 issue.)

MANUSCRIPT PREPARATION

In general, authors are advised to use the "Handbook for Authors" published by the American Chemical Society as a guide to the preparation of manuscripts (ACS, 1155 Sixteenth St., Washington, D.C. 20036). Another excellent reference work is "How to Write and Publish a Scientific Paper," by Robert A. Day (ISI Press, 3501 Market St., University City Science Center, Philadelphia, PA 19104).

Authors are encouraged to consider submissions in several categories and to prepare their manuscripts accordingly. The categories are:

Original Research Papers: The main technical content of the JOURNAL OF COATINGS TECHNOLOGY will continue to be original research papers. Editors support the trend in scientific writing to a direct, less formal style that permits limited use of personal pronouns to avoid repetitious or awkward use of passive voice.

Review Papers: Papers that organize and compare data from numerous sources to provide new insights and unified concepts are solicited. Reviews that show how advances from other fields can beneficially be applied to coatings are also desired. Reviews that consist mainly of computer searches with little attempt to integrate or critically evaluate are not solicited.

Open Forum: Topics for this category may be nontechnical in nature, dealing with any aspect of the coatings industry. The subject may be approached informally. Editors encourage submission of manuscripts that constructively address industry problems and their solutions.

Back to Basics: Papers that provide useful guides to Federation members in carrying out their work are solicited. Topics in this category are technical but focus on the "how to" of coatings technology. Useful calculations for coatings formulation and procedures that make a paint test more reproducible are examples of suitable topics. Process and production topics, i.e., paint manufacture, will also be reviewed in the *Back to Basics* category.

If a submitted paper consists of the text of a presentation made previously to a monthly or special meeting of a Society for Coatings Technology, or to another technical group, the name of the organization and the date of the presentation should be given. If someone other than the author of the paper made the presentation, this information, too, should be noted. Papers originally composed for oral presentation will have to be revised or rewritten by the author to conform to the style described in this guide.

Manuscripts should be typed with double spacing on one side of 8 1/2 x 11 inch (22 x 28 cm) paper, with at least one-inch (2.5 cm) margins on all four sides. All paragraphs should be indented five spaces, and all pages should be numbered at the top center, or upper right corner.

Title

The title should be as brief and informative as possible. Selection of titles that are key word-indexable is a helpful and recommended practice.

Authors' Biographies and Photographs

Give complete names, company or institutional affiliations, and brief biographical sketches of all authors. If available, submit a 5 x 7 inch (13 x 18 cm) black-and-white photograph with glossy or smooth high sheen surface, for each author. See later section on photographs for further details.

Abstracts

A 75-100 word abstract must be part of the manuscript, and should be a concise description of the key findings or teachings of the work described in the paper. The abstract should not repeat the title or include reference numbers, nor should it duplicate the Conclusion or Summary.

Text

Main headings and sub-headings should be used to improve readability, and to break up typographical monotony. The text should *not* be presented as an alphanumeric outline.

The main headings usually should be INTRODUCTION, EXPERIMENTAL, RESULTS AND DISCUSSION, and SUMMARY or CONCLUSIONS. Sub-headings will be specific to the subject.

Only as much review as is necessary should be given to provide an introduction to the subject; the main burden for extensive background should be placed on the list of references.

Standard scientific and technical terminology should be used to convey clear and unambiguous meaning, but the use of technical jargon or slang should be avoided. Authors should bear in mind that the JOURNAL has an international audience, for many of whom English is a second, not native, language. Use of regional idioms or colloquialisms should be avoided. The use of obscure abbreviations is also discouraged. When appropriate, abbreviations should be made in parenthesis immediately following first mention of the term in the text, and then used alone whenever necessary.

Recent issues of the JOURNAL should be consulted for desired style and technical level.

Metric System

Metric system units should be used wherever applicable with the equivalent English units shown afterwords in parentheses. The ASTM Metric Practice Guide, E 380-72 (American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103) is a convenient reference.

Tables, Graphs, and Drawings

Tables, rather than descriptive text, should be used only when they are genuinely helpful. They should be proportioned in accordance with the height and width limitations of the JOURNAL'S pages. Each table should be typed on a separate sheet, rather than included in the text, and appended to the manuscript. Each table should be numbered and have a descriptive caption. Tables should be referenced in the text (e.g., "See Table 1").

In numerical data in tables, numbers less than one should have a zero before the decimal point.

Graphs should be on good quality white or nonphotographic blue-lined 8 1/2 x 11 inch paper. Each graph should be drawn on a separate sheet, numbered, and the captions listed on a copy of the original graph. Graph captions and legends should also be typed on a separate sheet from original for typesetting.

Drawings should conform to the guidelines given for Graphs and should be proportioned to fit the height-to-width ratio of the JOURNAL'S pages and columns.

Photographs

All photographs should be sharp, clear, black-and-white prints no larger than 8 x 10 inches in size. Photos should be clearly labeled on the reverse side, taking care not to mar the image.

Color prints and slides are unacceptable.

When illustrations are secured from an outside source, the source must be identified and the Editor assured that permission to reprint has been granted.

Nomenclature

Whenever possible, generic names should be used in preference to trade names. When trade names must be used to avoid ambiguity, and the name is a registered trademark, the symbol R, in a circle or parentheses, should be given immediately following, and the manufacturer listed as a footnote. In general, trade names should be used only in footnotes or in an appendix, rather than in the text.

If special nomenclature is used, include a nomenclature table giving definitions and dimensions for all terms.

Nomenclature of chemical compounds should conform to the style of *Chemical Abstracts* and the IUPAC rules. For oligomeric or polymeric materials, characteristics such as molecular weight, polydispersity, functional group content, etc. should be provided.

Equations

Equations must be typed, or written clearly, with equations numbered sequentially in parentheses to the right. If Greek letters are used, write out their names in the manuscript margin at the first point of use. Place superscripts^o and subscripts_i accurately. Avoid the use of superscripts in a manner that can lead to their interpretation as exponents.

Summary

The paper should be concluded with a summary which is intelligible without reference to the main text. The summary may be more complete than the abstract, listing conclusions drawn from the text. A well written summary can serve to inspire the busy reader to turn back to the paper, to read it thoroughly.

Acknowledgment

If used, it should follow the summary.

References

These should be listed in the numerical order in which they are cited in the text, and should be placed at the end of the manuscript. Names of authors may or may not be shown in the text with reference numbers. If possible, include titles of articles referenced in the literature. The following are examples of acceptable reference citations for periodicals,^{1,2,3} books,⁴ and patents.⁵

- (1) Pascal, R.H. and Reig, F.L., "Pigment Colors and Surfactant Selection," *Official Digest*, 36, No. 475 (Part 1), 839 (1964).
- (2) Davidson, H.R., "Use and Misuse of Computers in Color Control," *JOURNAL OF COATINGS TECHNOLOGY*, 54, No. 691, 55 (1982).
- (3) Stephen, H.G., "Hydrogen Bonding—Key to Dispersion?," *J. Oil & Colour Chemists' Assoc.*, 65, No. 5, 191 (1982).
- (4) Patton, T. (Ed.), *Pigment Handbook*, Vol. 1, John Wiley & Sons, Inc., New York, 1973.
- (5) Henderson, W.A. Jr. and Singh, B. (to American Cyanamid Co.), U.S. Patent 4,361,518 (Nov. 30, 1982).

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FSCT—Year in Review



Over the past year, we have detailed in these pages the many and various changes either occurring or being discussed within the FSCT. At this point in time, having just returned from the FSCT convention in Chicago, we would like to review what has been happening and in what direction the future will take this organization.

FSCT'S TOP TEN (PLUS ONE)

1. The FSCT's International Coatings Expo and Technology Conferences, newly formatted annual convention, was extremely successful. New records were seen in registration, attendance, exhibiting supplier companies, and total exhibit space.
2. Under separate registration, the Technology Conferences garnered over 500 attendees—target registration was 200.
3. The FSCT Board of Directors directed that Bylaws be drafted to revise methods for acceptance of membership, greatly increasing the potential for Society/FSCT membership growth.
4. The Board also directed that Bylaws additions be drafted to initiate Common Interest Groups, thereby broadening the scope of FSCT activities in the industry.
5. These strategic planning Bylaws revisions will be voted on at the next meeting of the Board of Directors, in May 1997.
6. The May 1997 meeting of the Board of Directors will be hosted by the Birmingham (England) Club, making this the first time any FSCT meeting is held outside of North America.
7. FSCT Committees will be reviewed to establish mutually supportive missions, goals and objectives.
8. FSCT will investigate potential "partnering" arrangements with other industry organizations to further the mission and activities of the FSCT.
9. FSCT will study ways and means of increasing membership services and communication.
10. FSCT is now on-line. Visit our website at www.coatingstech.org.
11. On November 3-5, 1997, the FSCT will celebrate its 75th Anniversary in Atlanta. Plans are underway to make this a truly memorable occasion.

This is just a brief sampling of what has been happening in 1996 and what will happen in 1997. The FSCT and its Societies will grow stronger, becoming more efficient and effective in serving our members and the industry.

If you're not already a member, don't miss the boat! 1997 is going to be a great year!

Robert F. Ziegler
Executive Vice President

Spanish translations provided by Jesús Camacho, of Instituto Mexicano de Tecnicos en Pinturas y Tintas.

Characterization of Two-Stage Latexes Using Dynamic Mechanical Thermal Analysis—B. Rearick, S. Swarup, and P. Kamarchik

JCT, Vol. 68, No. 862, 25 (Nov. 1996)

Coatings, prepared from two-stage acrylic latexes, were characterized using dynamic mechanical thermal analysis (DMTA). The DMTA data, in conjunction with additional supporting data (differential scanning calorimetry (DSC), thermomechanical analysis (TMA), and particle size analysis), provided detailed information on copolymer compositions, latex particle morphologies, and coating morphologies.

Depending on monomer selection and monomer order of addition during polymerization, one of three different particle morphologies was obtained: two particles of different composition, two-phase particles, or interpenetrating polymer network (IPN) particles. Coating performance was highly dependent on latex and coating morphologies, as well as monomer composition. IPN latex morphologies produced coatings with superior mechanical properties and chemical resistance.

Caracterización de Latex dos Etapas Mediante el uso de Análisis Térmico Mecánico y Dinámico—B. Rearick, S. Swarup y P. Kamarchik

Fueron caracterizados recubrimientos, formulados a partir de latex acrílico de dos etapas, usando el método de análisis térmico mecánico y dinámico (DMTA). Los datos obtenidos mediante el DMTA, conjuntamente con datos adicionales obtenidos mediante otros métodos (calorimetría de búsqueda diferencial (DSC), análisis termomecánico (TMA) y análisis de tamaño de partícula) proporcionaron información detallada sobre la composición de los copolímeros, morfología de partículas de latex y morfologías de recubrimientos. Dependiendo de la selección y el orden del monómero de adición durante la polimerización, fué obtenida una de tres morfologías de diferentes partículas: dos partículas de diferente composición, partículas de dos fases o partículas de red de polímero interpenetrable (IPN). El desempeño del recubrimiento dependió en gran medida de las morfologías del latex y del recubrimiento, así como de la composición del monómero. Las morfologías de latex IPN proporcionaron recubrimientos con propiedades mecánicas y resistencia química superiores.

Aqueous Dispersions for Ultraviolet Light Curable Coatings—Z.J. Wang, J.A. Arceneaux, and J. Hall

JCT, Vol. 68, No. 862, 33 (Nov. 1996)

Aqueous dispersions of ultraviolet light (UV) curable resins have been prepared and evaluated. The physical and rheological properties of these dispersions have been determined, and the performance of these dispersions in coating systems has been studied. Coatings based on these dispersions have faster UV cure speed, better surface hardness, and better flexibility compared with coatings based on undispersed resins.

Dispersiones Acuosas para Recubrimientos Curables Mediante Luz Ultravioleta—Z.J. Wang, J.A. Arceneaux y J. Hall

Han sido preparadas y evaluadas las dispersiones acuosas de resinas curables mediante luz ultravioleta. También se determinó y estudió en sistemas de recubrimientos las propiedades físicas y reológicas de estas dispersiones. Los recubrimientos formulados en base a ellas tienen velocidades de curado UV más rápidas, mejor dureza superficial y son más flexibles comparados con los recubrimientos formulados mediante resinas sin dispersion.

Factors Affecting Dirt Pickup in Latex Coatings—A. Smith and O. Wagner

JCT, Vol. 68, No. 862, 37 (Nov. 1996)

Latex coatings are based on thermoplastic polymer. Their tendency to pickup dirt is greatly influenced by the glass transition temperature of the polymer. However, glass transition temperature is not, the only polymer property influencing dirt pickup; hydrophobic modification has been found to be particularly beneficial in textured coatings while monomer selection and crosslinking chemistries have beneficial effects on paints and elastomeric coatings. Good correlation has been found between water sensitivity, and water vapor permeability of polymer compositions, and the dirt pickup observed in coatings formulated with them.

Factores que Afectan la Recolección de Mugre en Recubrimientos Latex—A. Smith y O. Wagner

Los recubrimientos de latex están basados en polímeros termoplásticos, sus tendencias a recolectar mugre están determinadas en gran medida por la temperatura de transición vítrea del polímero. La temperatura de transición vítrea, sin embargo, no es la única propiedad que tiene influencia en la recolección de mugre. Se ha encontrado que la modificación hidrofóbica tiene particulares beneficios en los recubrimientos texturizados mientras que la selección de monómeros y químicos de entrecruzamiento tienen efectos beneficiosos sobre las pinturas y los recubrimientos elastoméricos. Ha sido descubierta una nueva correlación entre la sensibilidad del agua y la permeabilidad de las composiciones de polímeros con el levantamiento de mugre en los recubrimientos que han sido formulados con ellas.

Preparation of UV-Curable Emulsions Using PEG-Modified Urethane Acrylates and Their Coating Properties—M.-E. Song, J.-Y. Kim, and K.-D. Suh

JCT, Vol. 68, No. 862, 43 (Nov. 1996)

To prepare self-emulsifiable urethane acrylate, PEG-modified urethane acrylates (PMUA) containing polyoxyethylene groups as a terminal group were synthesized by the reaction of PEG [poly(ethylene glycol)] with residual isocyanate groups of a urethane acrylate. As the reaction molar ratio of PEG to HEMA increased, droplet sizes and viscosity of PMUA emulsions decreased, however, the tensile strength and conversion of UV-cured PMUA film decreased. The molecular weight and type polyol had a significant influence on emulsion droplet size and stability. The coating properties and mechanical properties of the UV-cured film were improved by using crosslinking agent and epoxy acrylate. However, centrifugal stability was decreased by the addition of these additives.

Preparación de Emulsiones Curables UV Usando Acrilatos de Uretano Modificado-PEG y las Propiedades del Recubrimiento—M.-E. Song, J.-Y. Kim y K.-D. Suh

Acrilatos de uretano modificado PEG (PMUA) conteniendo grupos polióxietileno como grupos terminales fueron sintetizados mediante la reacción de PEG [poli(etilén-glicol)] con grupos isocianato residuales de un acrilato de uretano para preparar acrilato de uretano auto-emulsificable. Como la razón molar de la reacción de PEG a HEMA incrementó, la viscosidad y los tamaños de la gota de las emulsiones PMUA decrecieron, sin embargo, la conversión y la tensión de la película curada UV de PMUA decreció. El peso molecular y el tipo de poliol tuvo una influencia signficante sobre la estabilidad y el tamaño de gota de la emulsión. Fueron mejoradas tanto las propiedades mecánicas y del recubrimiento de la película curada UV mediante el uso de el agente entrecruzamiento y acrilato epóxico. Sin embargo, la estabilidad centrifuga disminuyó debido a la adición de estos aditivos.



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1996-97 FSCT OFFICERS

Jay Austin, of Chicago Society, Elected 75th President of the Federation, at Annual Meeting in Chicago, IL

Jay Austin (Chicago Society), Halox Pigments, Hammond, IN, became the 75th President of the Federation of Societies for Coatings Technology, on October 25, 1996, at the close of the Federation's Annual Meeting, in Chicago, IL.

Thomas E. Hill (Western New York Society), formerly Vice President/Technical Director of the Consumer Group of Pratt & Lambert, Buffalo, NY, was named President-Elect, and Forest Fleming (Piedmont Society), Technical Director of Industrial Wood Building Products Group, Akzo Nobel Coatings Inc., High Point, NC, was elected to serve as Secretary-Treasurer.

President Austin

Mr. Austin is a member of the FSCT Executive and Finance Committees. He served as Chair of the FSCT Corrosion Committee for six years (1986-92), was a member of the Corrosion Committee, and served on the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY.

As well as being active in the Federation, Mr. Austin is a member of the Steel Structures Painting Council, National Association of Corrosion Engineers, and the American Society for Testing and Materials. He is a regular guest lecturer at Kent State University's coatings courses.



T.E. Hill



F. Fleming



T. Gelhot

Mr. Austin studied chemistry at Purdue University and coatings technology at both the University of Missouri-Rolla and North Dakota State University. He has worked in the coatings industry for 21 years.

President-Elect Hill

Mr. Hill is a Trustee of the Coatings Industry Education Foundation (CIEF) and is a member of the FSCT Executive Committee. He served as the Western New York Society Representative to the Federation Board of Directors from 1983-90. In addition, Mr. Hill has served on the Program, Investment, and Paint Show Exhibits Committees. He also served on the Program and Educational Committees of the Western New York Society.

A member of the coatings industry for 26 years, Mr. Hill was educated at West Virginia University and the State University of New York at Buffalo.

Secretary-Treasurer Fleming

Mr. Fleming currently serves on the Federation Executive Committee and is the Piedmont Society Representative to the Board of Directors.

He was President of the Piedmont Society (1989-90) and served on the Society's Publications and Technical Committees. In 1988, while serving as Membership Committee Chair, he was presented with a Certificate of Appreciation for the exemplary increase



J. Austin

of Society's membership during the 1987-88 year.

Mr. Fleming was graduated from Western Carolina University with a Bachelor of Science Degree and has been affiliated with the coatings industry for 19 years.

EXECUTIVE COMMITTEE

Terry Gelhot (St. Louis Society), Chemist, Carboline Co., St. Louis, MO, has been elected to serve a three-year term on the Federation Executive Committee.

Ms. Gelhot is currently on the FSCT Board of Directors as the St. Louis Society Representative and served on the Host Committee for the 1995 Annual Meeting held in St. Louis.

She served as President of the St. Louis Society and is currently the Society's Membership Chair. She received the Ralph Gatti Scholarship in 1984.

Ms. Gelhot graduated with a B.S. in Biology/Chemistry from Southeast Missouri State University and has been active in the coatings industry for 17 years.

BOARD OF DIRECTORS

A. Clarke Boyce (Toronto Society), retired from Nacan Products, has been elected for a two-year term on the FSCT Board of Directors.

Mr. Boyce, Past-President of the Federation (1982-83), received the Federation's most prestigious award, the George Baugh Heckel Award, in 1991. He chaired the FSCT Finance, Liaison, Nominating, and Paint History Committees. Mr. Boyce served on the FSCT Board

of Directors and was a member of the Annual Meeting Host, Annual Meeting Program, Bylaws, Investment, Liaison, Nominating, Planning, Society Speaker Awards, and Memorial Committees.

Mr. Boyce is a Past-President (1970-1971) and an Honorary Member of the Toronto Society and has chaired the Society's Educational, Technical, Manufacturing, Program, and Bylaws Committees.

He is a graduate of University of Western Ontario with a B.S. Degree and has served the coatings industry for 47 years.

Elected to serve two-year terms as Members-at-Large on the Board of Di-

rectors are Donald W. Boyd (Pittsburgh Society), Senior Research Associate, for PPG Industries, Inc., Pittsburgh, PA; and George R. Pilcher (CDIC Society), Technical Director, Coil and Extrusion Business Unit, for Akzo Nobel Coatings Inc., Columbus, OH.

Mr. Boyd served as Educational and Educational Coordinating Committee Chair from 1992-95 and served on the committee from 1989-95. In addition, he performed the duties of Vice President of CIEF in 1996 and served as a CIEF Trustee from 1992-96.

He was Educational Committee Chair of the Pittsburgh Society from 1985-88.

Mr. Boyd has degrees in Chemistry from MIT and Miami University (Ohio),

and Paper Technology from Miami University (Ohio). He has been active in the coatings industry for 13 years.

Mr. Pilcher has been involved on many FSCT committees, including the Professional Development Committee for which he was Chair from 1987-88. A member of the Annual Meeting Program Committee in 1986 and 1988-91, he chaired that group in 1989. He chaired the Roon Awards Committee in 1991 and served as a member from 1991-96. Mr. Pilcher has been a member of the Mattiello Memorial Lecture Committee (1991-1996) and serves as the 1996 Chair.

He was a member of the APJ/A.F. Voss Award Committee, Finance Committee, and Nominating Committee.

Mr. Pilcher has served as a member of the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY from 1993 to the present.

Mr. Pilcher served on the Board of Trustees of the CIEF from 1987 to the present and as President from 1989-95.

Currently a member of the CDIC Society, Mr. Pilcher began his involvement with the FSCT as a member of the Cleveland Society. He acted as Chair for the Society's Educational Committee in 1979-81 and as a member of that group from 1976-81. The Cleveland Society honored him with their prestigious "Certificate of Award" for "outstanding contributions" to that group.

Mr. Pilcher was graduated from College of Wooster, in 1970 with a B.A. in Chemistry and has been involved in the coatings industry for 26 years.

1996-97 Committee Chairs Appointed by President Austin

Chairpersons of 21 committees of the Federation of Societies for Coatings Technology for 1996-97 have been named by President Jay Austin. A complete roster of all committees will be published in the 1997 FSCT Year Book.

An asterisk (*) indicates re-appointment for 1996-97.

Annual Meeting Host—Jeff Shubert (Southern), Shubert Paints, Tucker GA.

Annual Meeting Program—Steve Hodges (Chicago), Halox Pigments, Hammond, IN.*

Armin J. Bruning Award—Robert T. Marcus (New York), Pantone Inc., Carlstadt, NJ.*

By-Laws—Fred Anwari (Cleveland), BFGoodrich Co., Brecksville, OH.

Corrosion—Charles Hegedus (Philadelphia), Air Products & Chemicals, Inc., Allentown, PA.*

Educational & Educational Coordinating—Melinda Rutledge (Los Angeles), Rheox, Inc., City of Industry, CA.*

Finance & Nominating—Darlene Brezin-ski (Southern), Consolidated Research, Inc., Kingsford, MI.

Heckel Award—James E. Geiger (Southern), Consultant, Largo, FL.

International Coatings Expo Exhibits Awards—Timothy Zeffiro (Pittsburgh), J.M. Gillen Co., Cuddy, PA.*

Inter-Society Color Council—Romesh Kumar (New England), Hoechst Celanese Corp., Coventry, RI.

Liaison—Joseph P. Walton (Cleveland), Jamestown Paint Co., Jamestown, PA.

Manufacturing—Don Mazzone (Golden Gate), Western Equipment, San Ramon, CA.*

Joseph J. Mattiello Lecture—Ted Provder (Cleveland), ICI Paints, Strongsville, OH.

Membership Services—Not available at this time.

Nominating—Darlene Brezinski.

Planning—Colin Penny (Baltimore), Coatings Technology, Hampton, VA.

Professional Development—Ronda Miles (Dallas), Bossco Industries, Inc., Plano, TX.

Publications—Brenda Carr (Cleveland), Coatings Development Co., Painesville, OH.

Roon Awards—Clifford Schoff (Pittsburgh), PPG Industries, Inc., Allison Park, PA.*

Society Secretaries Awards—Kevin Pelling (Toronto), Chemroy Canada Inc., Mississauga, Ont., Canada.

Technical Advisory—Freidun Anwari.*

Delegates to Other Organizations

National Association of Corrosion Engineers (NACE)—Mike Jackson (Louisville), Specialty Coatings Services, Louisville, KY.*

NPCA and Governmental Agencies—Sidney J. Rubin (New York), of Empire State Varnish Co., Brooklyn, NY.*

Steel Structures Paint Council (SSPC)—Charles Hegedus.*

FSCT/NPCA Joint Industry Advisory—Colin D. Penny.*

Coming Soon

The Federation of Societies for Coatings Technology is pleased to announce the upcoming release of two new monographs in its *Federation Series on Coatings Technology*:

"Adhesion Aspects of Polymeric Coatings"
by J.A. Baghdachi

and

"Finishing Exterior Wood"
by W.C. Feist

For more information on the complete Series, contact Meryl Simon, FSCT Headquarters, 492 Norris-town Rd., Blue Bell, PA 19422; 610-940-0777; Fax: 610-940-0292.

EPA's New Lead Regulation Provides Training For Lead-Based Paint Hazards Assessment

In its ongoing effort to reduce the public's exposure to lead hazards, the U.S. Environmental Protection Agency (EPA) has signed a new rule entitled *Lead: Requirements for Lead-Based Paint Activities*. These regulations are being issued to ensure that individuals conducting lead-based paint activities are well trained and qualified to assist in identifying and addressing lead-based paint hazards in homes.

Mandated under section 402 and section 404 of Title IV of the Toxic Substances Control Act (TSCA), the rule includes the following key elements:

- Training and certification requirements to ensure the proficiency of contractors who offer to conduct lead-based paint inspection, risk assessment and abatement services in residences and day care centers;
- Accreditation requirements to ensure that training programs provide quality instruction in current and effective work practices;
- Work practice standards to ensure that lead-based paint activities are conducted safely, reliably, and effectively; and
- Procedures for States and Indian Tribes to apply to EPA for authorization to administer these elements at the State or Tribe level.

For States and Tribes that choose to apply to EPA for authorization, the final rule also provides a model state lead

program that they can use to develop their programs. In States or Tribes that do not apply for EPA authorization to administer a program, EPA will proceed to establish a program based on the federal program elements contained in the rule.

The rule applies to those individuals, firms, and training providers involved in lead-based paint activities and training related to "target housing" and "child-occupied facilities." Target housing includes most private housing, public housing, housing receiving Federal assistance, and Federally owned housing built before 1978. Examples of child-occupied facilities include day-care centers, preschools, and kindergarten classrooms. The rule does not cover public or commercial buildings, superstructures, or bridges.

Because of the collaborative nature of the program with State and Tribal entities, there are several effective dates

associated with the new rule. To allow time for States and Indian Tribes to seek authorization from the EPA, the effective dates for the Federal program will not start until two years after publication of the rule.

The following dates will apply: August 31, 1998—training programs that want to offer lead training or refresher courses may first apply to EPA for accreditation.

March 1, 1999—All training programs that provide lead training or refresher training must be accredited, and individuals or firms that perform lead-based paint activities as defined in the rule may first apply to EPA for certification.

August 30, 1999—no individual or firm can perform lead-based paint activities as defined in the rule without certification from EPA; and all lead-based paint activities as defined in the rule must be performed according to applicable work practice standards.

A New Oil & Gas Group Created by Elf Atochem

Elf Atochem, Philadelphia, PA, has created a new business group to accommodate its oil and gas customers. Derived from the company's Technical Polymers Business Unit, the Oil & Gas Group will be responsible for the sales and marketing of engineering polymers and fluoropolymers.

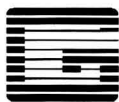
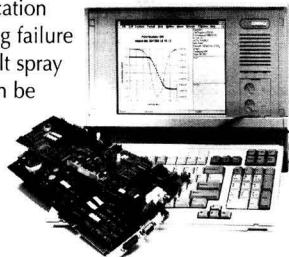
CDF Completes the Purchase of Cal-Formed's Liner Division

CDF Corp., Plymouth, MA, has acquired Cal-Formed Plastics' Liner Division. The purchase includes molds, customer lists, trade names, and Cal-Formed's "Saver Lid" and "Poly Topper" lines.

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Lawsuit Challenges EPA's Rule to Limit VOC Emissions

According to the National Paint & Coatings Association (NPCA), Washington, D.C., a lawsuit has been filed in the U.S. District Court for the Central District of California, in Los Angeles, challenging the U.S. Environmental Protection Agency's (EPA) promulgation of a national rule to limit volatile organic compound (VOC) emissions from archi-

tectural and industrial maintenance (AIM) coatings.

The proposed national rule was issued by EPA on June 25, 1996, and a final rule was expected to be published by late 1996. The agency has developed the proposed rule under authority of Section 183(e) of the Clean Air Act Amendments of 1990 (CAAA), which requires

VOC limits for consumer and commercial products, including AIM coatings. In drafting the CAAA, Congress expressed its preference that consumer products be regulated via a national standard if practical, since such products are sold and distributed through interstate commerce.

EPA's proposed rule is the culmination of several years of intensive discussions and negotiations involving the agency and a broad array of affected and interested parties.

"With certain refinements, EPA's proposed rule is fundamentally consistent with industry's suggested format. The rule calls for only one table of standards, providing crucial national uniformity and predictability for our industry," said NPCA President Andy Doyle.

Furthermore, NPCA will continue to offer comments to EPA in areas where it believes the rule can be improved. For example, NPCA recommends an extension of the compliance date, changes to certain definitions and a strengthening of an expedited variance procedure.

Most states with ozone nonattainment areas are depending on EPA's national rule to assist them in meeting their CAAA-mandated goals for VOC reduction. States in nonattainment areas who fail to develop plans for reducing ozone by 15% in 1996, and three percent per year thereafter, can lose federal highway funding and suffer other sanctions.

In early March, John Seitz, Director of EPA's Office of Air Quality Planning, issued a memorandum to states allowing them to claim a 20% VOC emissions reduction credit toward their required emissions reduction goal based on the agency's (then) soon-to-be-proposed national AIM VOC rule.

"If EPA had not issued the memo, many states, including those with large populations and significant markets for AIM coatings, would have felt compelled to issue their own individual AIM VOC regulations to ensure the integrity of their state implementation plans for meeting the 15% rate-of-progress requirement," said Mr. Doyle.

PPG Industries Acquires W.L. Schwaab Lackfabrik KG

PPG Industries Inc., Pittsburgh, PA, has acquired certain assets and the business of W.L. Schwaab Lackfabrik KG, a producer of transportation and industrial coatings in Weingarten, Germany. A new company was formed: PPG Industries Lackfabrik GmbH. Terms of the sale were not disclosed.

Report by The Freedonia Group Predicts Paint Industry Trends for the Next Century

A new study conducted by The Freedonia Group Inc., Cleveland, OH, predicts the demand for paint and coating chemicals in the United States will expand 1.4% annually through the year 2000 to 10.5 billion pounds. This study, titled *Paint & Coating Chemicals*, also forecasts that sales will lag shipments of paints and coatings, restrained by con-

tinued declines projected for solvents and the expanded use of water.

Despite the decreasing sales, the report states that the market value of these chemicals will enjoy good growth, stimulated by changes in the product mix favoring higher priced chemicals, particularly synthetic resins (e.g., acrylics, alkyds, vinyls, epoxies) and property-modifying additives (e.g., defoamers, biocides, etc.).

This publication states that threat and opportunities for various chemicals are affected primarily by reformulation of paint and coating products in response to intensifying regulatory and performance requirements. While reformulation to water-based paints is well established in the architectural segment, the industrial coatings sector has lagged behind. The move toward alternative industrial coating types—particularly water-based and high-solids formulations—will stimulate demand for resins, pigments and additives as solvent contents decline. As a result, the industrial coating chemicals market will expand its share of the market.

According to the report, opportunities are expected for synthetic resins, particularly acrylics and epoxies. Other predictions include the demand for additives and modifiers will grow just under three percent through the year 2000, while the demand for solvents in paints and coatings will decrease 0.6% annually.

Paint & Coating Chemicals is available from The Freedonia Group, Inc., 3570 Warrensville Center Rd., Ste. 201, Cleveland, OH 44122-5226; (216) 921-6800.

Monsanto Expands Modifier Manufacturing Facility

Monsanto Co., St. Louis, MO, will expand its Modaflow® acrylic flow modifier manufacturing facility in Nitro, WV. Scheduled to be on stream in November, the expansion will increase the plant's capacity by 50%.

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New York Society Seeks Papers for the Third Symposium on Additives and Modifiers

The New York Society for Coatings Technology, in conjunction with the Polytechnic University, Brooklyn, NY, will host the Third Biannual Symposium "Additives and Modifiers for Modern Coatings" on April 30-May 1, 1997 at the Holiday Inn—North Conference Center, Newark, NJ.

NYSCT is seeking abstracts of 150 words or less that focus on the theme. Additives and modifiers shall be defined as any coating ingredient that constitutes no more than five percent of the total weight of the coating. Modern coatings are defined as any of the most recent coating types aimed at environ-

mental conservation including powder coatings, UV-cured, high-solids, and waterborne.

Abstracts are due January 1, 1997. For additional information, contact Paul Mazer, Troy Corp., 8 Vreeland Rd., P.O. Box 955, Florham Park, NJ 07932-0955; Phone: (201) 443-0003; Fax: (201) 443-0257.

Spray Finishing Workshop Slated for January 8-10

Bowling Green State University and ITW DeVilbiss will conduct a "Spray Finishing Technology Workshop" on January 8-10, 1997, at the ITW DeVilbiss Training Center, in Maumee (Toledo), OH.

The workshop will emphasize spray finishing associated with industrial, contractor and maintenance applications, as well as automotive refinishing. Spray system and equipment selection, operation, maintenance, and surface and material preparation will also be included.

In addition, topics relating to the latest technologies—high volume low pressure (HVLP), for example—and environmental and regulatory concerns will be addressed. Each participant will have an opportunity for "hands on" experience with equipment.

For more information, contact Richard A. Kruppa, Professor of Manufacturing Technology, College of Technology, Bowling Green State University, Bowling Green, OH 43403.

ASTM Training Course Focuses on Paint VOCs

A training course focusing on how to obtain precise, meaningful VOC data from laboratory tests on paints and re-

lated coatings will be presented by the American Society for Testing and Materials (ASTM), West Conshohocken, PA, on March 14-15 in Atlanta, GA, and May 1-2, in Chicago, IL.

The course will include laboratory demonstrations on the use of gas chromatography, the Karl Fischer Titration Method, paint density, and other test methods needed to determine the VOC of coatings.

In addition, the basic principles of the ASTM test methods used to measure VOCs in the U.S. EPA's New Source Performance Standard will be covered.

The fee for the course is \$670. To register, contact Kristina Falkenstein, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959; (610) 832-9686.

Piedmont Society to Host Trade Show & Symposium

The Piedmont Society's Technical Committee will conduct a Mini-Trade Show & Symposium on March 19, 1997, at the Showplace on the Park, High Point, NC. The trade show will feature table top displays by raw material suppliers.

In addition, a series of presentations addressing individual professional development will focus on the theme "Communications: Key to the Future."

The forum is intended for members of the coatings, ink, and related industries.

For more information on the Mini-Trade Show & Symposium, contact Nellie Moretz, Lilly Industries, 2147 Brevard Rd., High Point, NC 27263; (910) 889-6344.

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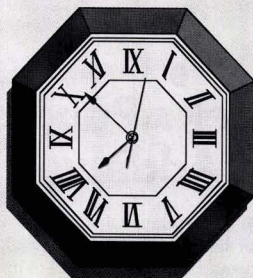
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Regulatory Update November 1996

This digest of current regulatory activity pertinent to the coatings industry is published to inform readers of actions which could affect them and their firms, and is designed to provide sufficient data to enable those interested to seek additional information. Material is supplied by National Paint and Coatings Association, Washington, D.C. The Regulatory Update is made available as a service to FSCT members, to assist them in making independent inquiries about matters of particular interest to them. Although all reasonable steps have been taken to ensure the reliability of the Regulatory Update, the FSCT cannot guarantee its completeness or accuracy.

Organic Air Emissions Amendments Scheduled for Publication—

At presstime, the U.S. Environmental Protection Agency (EPA) was scheduled to publish technical amendments to its rule regulating organic air emission standards for tanks, containers, and surface impoundments within the next few days. This regulation was originally published in December 1994, but these amendments are designed to clarify the regulatory text and to provide additional compliance options for owners and operators. In addition, this rulemaking postpones the effective date of the requirements until December 6, 1996.

Copies of this notice are available on EPA's Clean-up Information Bulletin Board, (301) 589-8366, under the file name "rcraamen.zip."

Environmental Protection Agency October 8, 1996—61 FR 52735 National Volatile Organic Compound Emission Standards for Architectural Coatings

Action: Proposed rule; reopening of public comment period

The Environmental Protection Agency (EPA) has announced that the comment period for the proposed National Volatile Organic Emission Standards for Architectural and Industrial Maintenance Coatings was extended from September 30, 1996 until November 4, 1996. This action was taken in response to requests for more time to gather information and to provide adequate time for all interested parties to submit comments. In addition, as a result of this extension, EPA is proposing a new compliance date of January 1, 1998.

For additional information, contact Ellen Ducey, EPA, (919) 541-5408.

Department of Transportation Research and Special Programs Administration

**September 25, 1996—61 FR 50252
Transportation of Hazardous Materials By Rail; Miscellaneous Amendments; Response to Petitions for Reconsideration**

Action: Final rule; editorial revisions and response to petitions for reconsideration

On June 6, 1996, the Research and Special Programs Administration (RSPA) published a final rule which amended the Hazardous Materials Regulations to incorporate a number of changes to rail requirements. The intended effect of this regulation is to improve safety and reduce costs to transporters of hazardous materials. This notice corrects errors in that rule and responds to petitions for reconsideration.

This final rule went into effect October 1, 1996. For more information, contact Beth Romo, RSPA, (202) 366-8553, or James Rader, Federal Railroad Administration, (202) 632-3339.

Department of Transportation Research and Special Programs Administration

**September 26, 1996—61 FR 50616
Performance-Oriented Packaging Standards; Final Transitional Provisions**

Action: Final rule

The Research and Special Programs Administration (RSPA) is incorporating into the Hazardous Materials Regulations (HMR) a number of revisions to the classification of certain hazardous materials which are poisonous by inhalation and to provisions for

the manufacture, use and reuse of hazardous materials packagings. These amendments are the result of petitions for rulemaking, public comments and agency initiative, and are intended to improve safety and reduce compliance costs.

Among the changes is authorization for the use of non-bulk packagings that were filled before October 1, 1996 to be offered for transportation until October 1, 1999, adding an extension of three years for compliance. The Hazardous Materials Table (HMT) would be amended to change the hazard zone for some materials which are poisonous if inhaled and to add other materials to that list. The agency is also reinstating pressure testing requirements for portable tanks.

Because these modifications affect provisions scheduled to go into effect October 1, 1996, the RSPA is authorizing immediate voluntary compliance. The final effective date is January 1, 1997.

For further information, contact RSPA's Beth Romo, (202) 366-8553, or Bill Gramer, (202) 366-4545.

Environmental Protection Agency October 1, 1996—61 FR 51321 Addition of Reporting Elements; Toxic Chemical Release Reporting; Community Right-to-Know; Notice of Public Meetings; Proposed Rules

Action: Advanced notice of proposed rulemaking (ANPR)

The Environmental Protection Agency (EPA) intends to expand its Community Right-to-Know initiatives to increase the information available to the public on chemical use. This advanced notice of proposed rulemaking gives notice of EPA's consideration of this issue, and solicits comments on all aspects of chemical use and collection of chemical use data.

EPA is considering all potential components of chemical use, including the amount of a toxic chemical entering a facility and the amount leaving the facility after being transformed into products and wastes. The agency believes that the collection of additional chemical use information beyond that contained in the Toxic Release Inventory (TRI) database could provide a more detailed picture about toxic chemicals in communities.

A number of important concerns associated with the reporting and interpretation of chemical use information have been raised, and EPA has determined that additional evaluation would be appropriate before a proposal can be developed. In this ANPR, EPA is (1) describing plans to evaluate these issues; (2) providing preliminary notice of additional public meetings; (3) requesting comment and information; (4) soliciting actual assessments of the issues; and (5) seeking public input regarding development of regulations in this area.

Comments on this proposal must be received by December 30. Submit comments, in triplicate, to OPPT Docket Clerk, TSCA Document Receipt Office (7407), Office of Pollution Prevention and Toxics, EPA, Rm. E-G099, 401 M St. S.W., Washington, D.C. 20460. Electronic copies may be sent to Oppt.nic@epamail.gov as an ASCII or WordPerfect 5.1 file. Please identify all copies with docket number OPPTS-400106.

For specific information on this ANPR, contact EPA's Matt Gillen, (202) 260-1801. For information on EPCRA section 313, contact the EPCRA Hotline (800) 535-0202.

**Environmental Protection Agency
October 2, 1996—61 FR 51397
Extension of Comment Period for the
Proposed Identification and Listing
of Hazardous Waste/Solvents
Action: Proposed rule; extension of
comment period**

The Environmental Protection Agency (EPA) is extending the comment period for the proposed listing determination for spent solvents, which appeared in the *Federal Register* on August 14, 1996 (61 FR 42318). The comment period, which was initially to end on October 15, has been extended until November 14.

Under the proposal, EPA would not add the waste from the

use of 14 different solvents to the list of hazardous wastes that are regulated according to the Resource Conservation and Recovery Act (RCRA). The determinations in the proposed rule are limited to specific solvent wastes and made pursuant to the current regulatory structure that classifies waste as hazardous either through a specific listing or as defined under hazardous waste characteristics.

Please send an original of all comments, plus two copies, to EPA RCRA Docket Number F-94-SLDP-FFFF, RCRA Information Center (5305W), EPA, 401 M St. S.W., Washington, D.C. 20460.

For technical information on this notice, contact Ron Josephson, EPA, (703) 308-8890.

**Environmental Protection Agency
October 7, 1996—61 FR 52287
Benzidine-Based Chemical Sub-
stances; Significant Uses of Cer-
tain Chemical Substances
Action: Final rule**

Under this final regulation, the Environmental Protection Agency (EPA) is promulgating a significant new use rule (SNUR) under the Toxic Substances Control Act which requires persons to notify the agency at least 90 days before beginning the manufacture, import, or processing of certain benzidine-based chemical substances. This action is necessary because benzidine-based chemicals may be hazardous to human health, and the uses covered by this rule may result in exposure to workers handling the substances. This rulemaking, which will go into effect November 20, 1996, is applicable to manufacturers of organic dyes and printing ink.

For additional information, contact Susan Hazen, EPA, (202) 554-1404, e-mail: TSCA-Hotline@epamail.gov.

**Environmental Protection Agency
October 7, 1996—61 FR 52588
Facility Identification Initiative
Action: Notice and request for com-
ments**

As part of the Environmental Protection Agency's (EPA) effort to "reinvent" environmental regulations, the agency is seeking comment on a number of options to standardize facility data reporting. Specifically, EPA is considering methods for establishing a national standard for the reporting and maintenance of

information regarding the identification of facilities that are subject to federal environmental reporting and permitting requirements. A standardized facility identification system could reduce the reporting burden on industry and could increase public access to environmental data.

The agency is requesting comments on various options for maintaining a facility identification system. The new system would affect permitting requirements under federal laws such as the Emergency Planning and Community Right-to-Know Act, the Clean Air Act, the Toxic Substances Control Act, and Resource Conservation and Recovery Act.

Written comments on this notice must be received, in triplicate, by December 23. Send comments to TSCA Document Receipt Office (7407), EPA, Office of Pollution Prevention and Toxics, 401 M St. S.W., Washington, D.C. 20460. Please include the document control number OPPTS-00186.

For more information, contact EPA's Sam Sasnett, (202) 260-8020, or Mary Hanley, (202) 260-1624.

**Environmental Crimes Bill
Introduced in Senate**—The Environmental Crimes and Enforcement Act (S. 2096), which would increase penalties for environmental crimes and would provide prosecutors with new ways to prevent such crimes, was introduced in the Senate on September 19. The basis for the legislation was presented by President Clinton on a campaign stop during the Democratic convention.

Among other things, the measure would:

- increase the maximum prison sentence for serious injuries or deaths occurring as a result of a violation of most pollution control or hazardous materials transportation regulations;
- allow prosecutors to seize the assets of those charged with environmental crimes prior to a conviction;
- extend the statute of limitations for environmental crimes an additional three years if a polluter has deliberately concealed a violation;
- force individuals convicted of violating federal environmental laws to help pay for the cost of their prosecution, and for cleanup

and restitution of the polluted area; and

- permit prosecutors to charge individuals or companies with attempted criminal acts against the environment even if the violation itself is not committed.

The session ended without any further action being taken on the measure. The bill's sponsor, Senator Frank Lautenberg (D-NJ), stated that he hopes the issues raised will be considered in legislation in the next Congress.

1997 EPA Budget Approved—On September 26, President Clinton signed the fiscal 1997 appropriations bill, which included funding for the Environmental Protection Agency. This measure did not contain any controversial riders aimed at restricting the agency and its authority that doomed the 1996 bill. However, it does provide a slight increase over last year's funding level. Programs that received the largest budget increase included hazardous waste cleanup of Superfund sites.

The conference committee report on the bill calls for major studies on the expansion of the Toxics Release Inventory program and on the effects of endocrine disruptors on human health. Environmentalists are concerned that the proposed study on endocrine disruptors, which are chemicals that have been linked to immune system problems in animals, may delay implementation of a provision in the recently enacted Safe Drinking Water Act. Language in that bill called for testing and evaluation of endocrine disruptors.

In Brief:—On September 24, the House passed H.R. 3153, the Small Business Regulatory Relief Act. The legislation would exempt the transportation of small quantities of certain hazardous materials, known as "materials of trade," by vehicles with a gross weight rating under 10,000 pounds from hazardous materials requirements. The intent of the measure is to

provide an exemption for businesses that are not major carriers and must transport small quantities of hazardous materials.

In the final days before adjournment, Congress approved and President Clinton signed legislation (H.R. 3723) which makes stealing proprietary trade secrets a federal crime, with increased penalties for thefts on behalf of foreign governments or companies. The bill included the text of a Senate measure, which establishes prison terms for computer hacking.

If reelected, President Clinton has announced that he plans to make passage of the Chemical Weapons Convention (CWC) treaty a top priority for the next Congress. The CWC would ban the manufacture, distribution, stockpiling and use of chemical weapons. However, the treaty was withdrawn from Senate consideration in September over concerns with certain provisions regarding inspection procedures and verification.

States Proposed Legislation and Regulations

ALABAMA

Air Quality (Proposed Regulation)—A proposed regulation (15 ALAM 823; 8/30/96) issued by the Alabama Department of Environmental Management (DEM) would permanently exempt all potential major sources whose emissions are less than 75 percent of the major source threshold from synthetic minor operating permit requirements. Contact James Warr, DEM, (205) 271-7710.

ARIZONA

Occupational Safety and Health (Regulation)—The Arizona Industrial Commission (IC) adopted a final rule which incorporates by reference standards for hazard communication in general industry and for occupational exposure to lead. The rule went into effect August 28. Contact Catherine Neville, IC, (602) 542-1695.

Solid Waste (Regulation)—A final regulation (2 AZAR 3632; 8/23/96) of the Arizona Department of Environmental Quality (DEQ) establishes additional procedures for the installation, upgrade, maintenance, operation and

closure of underground storage tank systems. The rule went into effect July 30. Contact Martha Seaman, DEQ, (602) 207-2222.

CALIFORNIA

Air Quality—CA A. 2937 (Brulte) requires the state air resources board and local air pollution control districts to adopt regulations classifying minor violations. The governor signed the legislation on September 21.

Air Quality (Proposed Regulation)—The California Air Resources Board (CARB) has proposed a regulation which would, among other things, postpone the 25 percent air quality standard for aerosol adhesives and amend test methods prohibiting the alteration of records to inaccurately report product formulation or manufacturing information. Contact Rich Bradley, CARB, (916) 322-6076.

Graffiti—CA A. 2295 (Sweeney and Thompson) authorizes the court to order a person convicted of a graffiti offense to keep the damaged property or another property free of graffiti for a specified period of time. The

governor signed the bill on September 17.

CA A. 2331 (Goldsmith and Albert) requires the court to suspend the driving privileges of a person convicted of defacing property with graffiti for one year. On September 25, the measure was signed into law by the governor.

CA A. 2433 (Harvey) increases the maximum fine and community service time for individuals convicted of multiple graffiti offenses. The bill was signed by the governor on September 23.

Hazardous Materials Transportation—CA A. 2201 (House) repeals provisions that require the inspection of vehicles and containers used to transport hazardous materials. The governor signed the measure on September 14.

Hazardous Materials Transportation (Regulation)—The California Highway Patrol (CHP) adopted a final rule which incorporates by reference federal standards for incidentally transported hazardous materials, emergency response communication procedures, and reporting requirements for incidents involving hazardous materials or wastes. The regulation was effective September 13.

Contact Steve Brown, CHP, (916) 327-3310.

Hazardous Waste—CA A. 1651 (Richter) requires the adoption of regulations to clarify and improve the recovery of hazardous waste cleanup oversight costs. The governor signed the bill on September 15.

CA S. 1063 (Peace), among other things, (1) requires the state by July 1, 1997, to evaluate current "California-only" hazardous waste classification criteria, guidelines or testing requirements as they pertain to zinc-containing waste streams; and (2) expresses the intent of the legislature that zinc-containing wastes be regulated by the state consistent with RCRA. The legislation was signed by the governor on September 11.

CA S. 1757 (Calderon) exempts surface impoundments constructed before July 1, 1986 from land disposal prohibitions under the federal Resource Conservation and Recovery Act and minimum treatment standards. The legislation was signed by the governor on September 19.

Lead—CA A. 1195 (Morrissey) requires the state to adopt regulations that define a de minimis amount of lead use and provides that any employer who is within this definition can be exempted from payment of certain fees. The bill was signed into law by the governor on September 21.

Occupational Safety and Health (Regulation)—A final regulation adopted by the California Department of Industrial Relations (DIR), among other things, changes the time frame for reporting a serious injury or fatality in the workplace from 24 hours to eight hours. The rule was effective September 1. Contact Michael Mason, DIR, (415) 972-8600.

Occupational Safety and Health (Proposed Regulation)—A proposed regulation issued by the California DIR would incorporate by reference federal standards for exposure to cadmium in general industry. Contact John MacLeod, DIR, (916) 322-3640.

Toxic Substances—Proposition 65 (Notice)—The California Office of Environmental Health Hazard Assessment (OEHHA) has announced the addition of ten more chemicals to the list of chemicals that are known to cause cancer or reproductive toxicity, as

required under Proposition 65. The amended list was effective September 1. Contact OEHHA, (916) 445-6900.

Recycling—CA A. 3474 (Committee on Environmental Safety) deletes the requirement that a material be recycled within 90 days of its generation.

COLORADO

Air Quality (Regulation)—The Colorado Air Quality Control Commission (AQCC) has adopted a regulation which incorporates by reference federal maximum achievable control technology requirements for aerospace manufacturing, hazardous organic national emission standards for hazardous air pollutants, shipbuilding and repair facilities, and wood furniture and manufacturing operations. The rule became effective September 30. Contact AQCC, (303) 692-3100.

Community Right-to-Know (Proposed Regulation)—A proposed rule of the Colorado Department of Public Health and Environment (DPHE) amending hazardous waste notification standards would require facilities to prepare community involvement plans as part of Part B permit application procedures and to make certain that the local community is adequately informed. Contact DPHE, (303) 692-3300.

Hazardous Materials Transportation (Regulation)—The Colorado Department of Public Safety adopted a final rule which updates the requirements concerning vehicles transporting hazardous materials to reflect current federal amendments. The regulation went into effect September 30. Contact State Patrol, (303) 239-4500.

IDAHO

Hazardous Waste (Proposed Regulation)—The Idaho Department of Health and Welfare (DHW) proposed a regulation (1996 IDAB 86; 9/4/96) which would update current hazardous waste requirements to make them consistent with federal standards. Contact John Brueck, DHW, (208) 373-0502.

ILLINOIS

Air Quality (Proposed Regulation)—A proposal (20 ILR 11440;

8/23/96) issued by the Illinois Pollution Control Board (PCB) would require sources that manufacture, process or import more than 25,000 pounds or use more than 10,000 pounds per year of any individual toxic air pollutant to submit a report to the state listing the total emissions. Contact Dorothy Gunn, PCB, (312) 814-6062.

INDIANA

Air Quality (Proposed Regulation)—A proposed regulation (19 INR 3548; 9/1/96) of the Indiana Air Pollution Control Board (APCB) would establish recordkeeping and reporting requirements and compliance certification procedures for sources that use compliant coatings or control devices. Contact Patricia Troth, DEM, (317) 233-5681.

Hazardous Waste (Proposed Regulation)—The Indiana Department of Environmental Management (DEM) proposed a rule (19 INR 3555; 9/1/96) which would update the hazardous waste management permit program to be consistent with federal standards; incorporate federal requirements for public participation in the hazardous waste facility permitting process; and update hazardous materials transportation requirements. Contact Steven Mogonnier, DEM, (317) 233-1655.

KENTUCKY

Air Quality (Proposed Regulation)—A proposed regulation (23 ARKY 1109; 8/1/96) of the Kentucky Department for Environmental Protection (DEP) would establish air emission standards for tanks, containers, and surface impoundments, including requirements for closed-vent systems, reporting, monitoring and recordkeeping. Contact James Hale, DEP, (502) 564-2225.

Hazardous Waste (Proposed Regulation)—The DEP has proposed regulations (23 ARKY 8/1/96) which would, among other things, incorporate by reference test methods for determining hazardous waste characteristics; update the list of hazardous wastes from non-specific sources; revise reporting requirements for generators of hazardous waste; and amend the list of wastes that have been exempted from the

definition of hazardous waste. Contact James Hale, DEP, (502) 564-2225.

Proposed regulations (23 ARKY; 8/1/96) of the Kentucky DEP would (1) amend land disposal restrictions; (2) specify hazardous wastes not subject to land disposal restrictions; (3) extend the effective dates for surface impoundments regulated under hazardous waste requirements; (4) incorporate federal test methods for evaluating solid waste; (5) establish treatment standards for hazardous waste; and (6) adopt universal treatment standards. Contact James Hale, DEP, (502) 564-2225.

The Kentucky DEP proposed a rule (23 ARKY 1222; 8/1/96) which would establish standards for small quantity handlers of universal wastes by adopting waste management procedures; specifying labeling requirements; setting up procedures for tracking waste shipments; and establishing training programs. Contact James Hale, DEP, (502) 564-2225.

Hazardous Materials Transportation (Proposed Regulation)—A proposed regulation (23 ARKY 1010; 8/1/96) issued by the Kentucky Transportation Cabinet would incorporate by reference federal standards regarding the transportation of hazardous materials by highway or air. Contact Sandra Pullen, Transportation Cabinet, (502) 564-4890.

Transportation (Proposed Regulation)—A proposed rule (23 ARKY 1399; 9/1/96) has been introduced by the Kentucky Transportation Cabinet (TC) which would establish medical standards for licensing of drivers, including license restrictions. Contact Sandra Pullen, TC, (502) 564-4890.

LOUISIANA

Lead (Regulation)—A final regulation (22 LAR 711; 8/20/96) of the Louisiana Department of Health and Hospitals (DHH) amends current lead poisoning control requirements to make them consistent with state and federal laws. The rule was effective August 20. Contact DHH, (504) 826-2347.

MAINE

Air Quality (Proposed Regulation)—A regulation proposed by

the Maine Department of Environmental Protection (DEP) would, among other things, establish performance standards, work practices and emission limits for regulated industries; address public health issues regarding hazardous air pollutants; and incorporate federal reporting and recordkeeping requirements. Contact Deb Avalone-King, DEP, (207) 287-2437.

MICHIGAN

Occupational Safety and Health—MI H. 5861 (Green) revises reporting requirements to the state Department of Labor of fatalities to conform with federal occupational safety and health requirements. On September 25, the bill was approved by the House and referred to the Senate Committee on Human Resources, Labor and Veterans Affairs.

MINNESOTA

Lead (Notice)—The Minnesota Department of Health (DOH) is soliciting proposals (21 MNSR 251; 8/19/96) for grants that would pay for the purchase and maintenance of lead cleanup equipment and for the relocation of families displaced by lead abatement activities in their residence. Contact Douglas Benson, DOH, (612) 627-5480.

Solid Waste (Proposed Regulation)—The Minnesota Office of Environmental Assistance (OEA) intends to adopt requirements (21 MNSR 284; 8/26/96) for the state environmental assistance grant program, which would be used to award loans for the development and implementation of programs dealing with resource recovery, hazardous substances, pollution prevention, and recycling. Contact Erin Barnes-Driscoll, OEA, (612) 296-3417.

MISSOURI

Air Quality (Proposed Regulation)—A proposed rule (21 MOR 1844; 8/15/96) of the Missouri Department of Natural Resources (DNR) would amend current air quality and pollution control requirements for solvent cleanup operations that are located in the St. Louis metropolitan area, including the removal of an operating option. Contact Roger Randolph, DNR, (314) 751-4817.

MONTANA

Air Quality (Regulation)—A final rule (1996 MTAR 2293; 8/22/96) adopted by the Montana Department of Environmental Quality (DEQ) allows facilities to make minor modifications without revising their air quality preconstruction permits. The regulation became effective August 23. Contact DEQ, (406) 444-2544.

The Montana DEQ adopted a regulation (1996 MTAR 2298; 8/22/96) which incorporates by reference federal guidelines for the administration of maximum achievable control technology requirements for hazardous air pollutants. The rule went into effect August 23. Contact DEQ, (406) 444-2544.

Hazardous Waste (Proposed Regulation)—A proposal (1996 MTAR 2357; 9/5/96) issued by the Montana DEQ would amend hazardous waste management requirements by revising permitting requirements; recyclable materials criteria; and standards concerning discarded commercial chemical products, and container and spill residues. Contact Mark Stahly, DEQ, (406) 444-3742.

NEW HAMPSHIRE

Air Quality (Regulation)—The New Hampshire Department of Environmental Services (DES) introduced an interim rule (16 NHHR 14; 9/13/96) which establishes criteria for classifying toxic air pollutants; sets up procedures for determining ambient air limits for each pollutant; and allows the state to classify each pollutant according to its toxicity level. The rule went into effect August 24 and will expire December 22, 1996. Contact Susan Jones, DES, (603) 271-7874.

NEW JERSEY

Lead (Proposed Regulation)—A proposed rule of the New Jersey Department of Community Affairs (DCA) would establish requirements for lead hazard evaluation and abatement to protect consumers in any transfer of real estate. Contact Michael Tickin, DCA, (609) 633-7899.

NEW MEXICO

Solid Waste (Proposed Regulation)—The New Mexico Environ-

mental Improvement Board (EIB) intends to propose revisions to current requirements for underground storage tanks in the areas of registration, upgrades, release detection and financial responsibility. Contact EIB, (505) 827-2842.

NEW YORK

Hazardous Waste (Proposed Regulation)—A rule proposed by the New York Department of Environmental Conservation (DEC) would incorporate amendments to the federal hazardous waste management program. A hearing on the proposal was held on November 14; comments are due on November 25. Contact Antoinette Norfleet, DEC, (518) 457-0532.

NORTH CAROLINA

Water Quality (Proposed Regulation)—A proposed regulation issued by the North Carolina Department of Environment, Health and Natural Resources (DEHNR) would allow local governments to implement storm water management systems through their existing drinking water supply watershed protection program. A hearing on this proposal will be held on November 21. Contact Liz Kovasckitz, DEHNR, (919) 733-5083.

OKLAHOMA

Air Quality (Proposed Regulation)—A proposed regulation (13 OKR 3865; 9/16/96) of the Oklahoma Department of Environmental Quality (DEQ) would, among other things, amend requirements for operating, construction, and relocation permits for air pollution sources; revise the definitions of "major source" and "regulated pollutant"; and update standards governing insignificant activities. Contact Joyce Sheedy, DEQ, (405) 290-8247.

Hazardous Waste (Proposed Regulation)—The Oklahoma Department of Environmental Quality (DEQ) proposed a regulation (13 OKR 3534; 9/3/96) concerning hazardous waste management which would eliminate fees for review and processing of permit modifications; reduce monitoring fees for inactive treatment, storage, and

disposal facilities; and limit the requirements for tank and container recyclers. Comments were due on November 15. Contact Catherine Sharp, DEQ, (405) 271-5338.

OREGON

Air Quality (Regulation)—The Oregon Department of Environmental Quality (DEQ) adopted a final rule (36 ORRB 7; 9/1/96) which establishes fees to fund a pilot pollution prevention tax credit program. The program, effective July 24, applies to businesses regulated under certain national emission standards for hazardous air pollutants. Contact Susan Greco, DEQ, (503) 229-5213.

Air Quality (Proposed Regulation)—A proposed rule (36 ORRB 18; 9/1/96) issued by the Oregon DEQ would set up major new source review requirements for areas that have been redesignated from nonattainment to attainment. Contact Susan Greco, DEQ, (503) 229-5213.

Transportation (Regulation)—A final regulation (36 ORRB 12; 9/1/96) adopted by the Oregon DOT reduces the requirements for vision screenings that applicants must meet before the issuance of a commercial drivers license. The rule became effective August 15. Contact Brenda Trump, DOT, (503) 945-5278.

RHODE ISLAND

Air Quality (Regulation)—A final regulation of the Rhode Island Department of Environmental Management (DEM) amends standards for the control of volatile organic compounds from wood products manufacturing operations by altering the averaging time for emission caps to 12 months, and listing procedures for determining compliance with emission limits. The rule went into effect July 7. Contact Barbara Morin, DEM, (401) 277-2808.

SOUTH CAROLINA

Hazardous Waste (Proposed Regulation)—A proposed regulation (20 SCSR 73; 8/23/96) of the South Carolina Department of Health and Environmental Control (DHEC) would conform state

hazardous waste management provisions with federal standards by (1) amending recordkeeping and reporting requirements; (2) adopting 10-year permit renewal periods; (3) revising permit modification procedures; (4) specifying criteria for marking and labeling containers; and (5) reducing land disposal restriction notifications for small quantity generators of hazardous waste. A hearing on the proposal will be held on November 14 in Columbia. Contact Suzanne Rhodes, DHEC, (803) 896-4174.

TENNESSEE

Hazardous Waste (Proposed Regulation)—The Tennessee Department of Environment and Conservation (DEC) proposed a regulation (22 TNAR 47; 9/13/96) which would, among other things, (1) update hazardous waste management standards to conform with federal requirements; (2) amend test methods; (3) set up air emission standards for tanks, containers, and surface impoundments in which hazardous waste is stored; and (4) amend provisions for hazardous waste generated by conditionally exempt small quantity generators. Contact Gerald Ingram, DEC, (615) 532-0882.

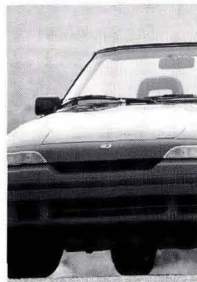
VIRGINIA

Air Quality (Regulation)—The Virginia Department of Environmental Quality (DEQ) adopted a regulation (12 VAR 3347; 9/2/96) which amends requirements for the federal operating permits and permit program fees for stationary sources. The rule became effective October 15. Contact Kathleen Sands, DEQ, (804) 698-4413.

The Virginia Air Pollution Control Board (APCB) adopted a final rule which requires owners of an affected source to operate within the terms of conditions of their permits; provides compliance options under the Title V operating permit requirements of the federal Clean Air Act; and extends the requirements of Title V to sources of air emissions covered under Title IV. The regulation was effective October 15. Contact Robert Mann, APCB, (804) 698-4419.

A Challenge: Aluminum Pigments in Aqueous Coatings

David P. Chapman—Silberline Manufacturing Co., Inc.*



The coatings industry has been in an evolutionary process of formulating to reduce the levels of volatile organic compounds in coatings. The process has been

driven by regulatory considerations.

The aluminum pigment manufacturer has been in lock step with this process to develop user-friendly treated aluminum pigments for aqueous coatings. The focus of this paper is to present a historical overview of the progress, to date, and review two new surface treatment technologies recently introduced to the industry. These new chemistries give the coatings formulator more options in the process of creating aqueous aluminized coatings.

Formulating techniques are presented utilizing treated aluminum pigment technologies, along with formulations, where appropriate, representing commercially available resin systems.

These technologies can be and are used in general industrial coatings, industrial maintenance formulations, high performance maintenance systems, roof coatings, as well as automotive OEM and refinish coatings.

When was the last time you gave any thought to the significance of 174°F in your daily life? Life has many simple pleasures which are taken for granted—like waking up to the scent of coffee brewing or bacon sizzling on the stove. What about the warm, comfortable, pleasant scent that harks our memory back to Grandma's kitchen, where freshly baked bread is prepared? Actually, this wonderful aroma, from baking

bread, occurs at 174°F when ethanol is emitted as a gas. This industry, too, as the coatings industry, is being regulated by the 1990 Clean Air Act. Many large bakeries are now required to submit plans to eliminate the pollution of ethanol in the atmosphere during the baking process.¹ The coatings industry is just one facet of our busy lives impacted by the Clean Air Act of 1990.²

The coatings industry has been in an evolutionary process of formulating to reduce the levels of volatile organic compounds in coatings. The process has been driven by regulatory considerations, not only at the national level, but at the state and local levels as well. State and local laws limiting VOCs in industrial coatings have been in place for a number of years, creating a need for alternatives to the traditional high VOC solvent-based coatings. At the Federal level, in 1990 Congress enacted the Clean Air Act amendments which broadened the mandate for volatile organic compound reduction over the next 10 years.

The extent of the regulatory process in future years is shown in Table 1. This table shows maximum VOC contents of coatings—extracts from the table of standards as shown in Appendix II EPA final framework from the AM coatings rule, July 14, 1994.³

Additionally, the ACT targeted many commonly used coatings solvents as hazardous air pollutants: toluene, xylene, methyl ethyl ketone, methyl isobutyl ketone, methanol, and ethylene glycol monyl butyl ether.⁴

With this double-edge regulatory sword, the aluminum pigment manufacturer and the coatings formulator must keep both eyes open—one on VOCs and the other on solvent choice. An additional challenge for the aluminum pigment manufacturer is to provide aluminum pigments which will function well in aqueous coatings, providing good gas stability, aesthetics, and application characteristics.

With the shift to lower VOCs in general industrial coatings, industrial maintenance formulations, high performance maintenance systems, roof coatings, automotive refinish, and OEM coatings, the choice of resin system is gravitating toward water-reducible and waterborne coatings.

As defined in ASTM D 3960, a volatile organic compound, VOC, is any organic compound that participates in atmospheric photochemical reactions.

To calculate determined VOC, the following formulas are used by the American Society for Testing and Materials under Method D 3960.

Table 1—Maximum VOC Contents of Coatings

Category	1996 (g/L)	2000 (g/L)	2004 (g/L)
Industrial maintenance coatings	350	350	300
High performance coatings			
Floor coatings	400	350	300
Rust-preventive coatings	400	350	300
Concrete protective coatings	400	350	300
Metallic-pigmented coatings	500	450	400
Traffic marking paints	150	150	100
Low volume coatings			
Anti-fouling coatings	450	450	450
Extreme high durability coatings	800	800	800
High temperature coatings	650	650	650
Impacted immersion coatings	780	780	780
Nuclear power plant coatings	450	450	450
Pre-treatment wash primers	780	780	780
Repair/maintenance thermoplastic coatings	650	650	650

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*Lincoln Dr., P.O. Box B, Tamaqua, PA 18252-0020.

(1) Determine the non-volatile content of the coating—ASTM Method D 2369.

(2) Determine the density of the materials—ASTM D 1475.

(3) Determine the water content—ASTM D 4017.

(4) VOC (Grams/Liter* -H₂O) =

$$1000 \times \frac{[(100 - \%NV)(DM) - (\%H_2O)(Dm)]}{100 - [(\%H_2O)(Dm)]}$$

.997

- % NV = % non-volatile
- Dm = density of paint in gm/ml
- % H₂O = % of water by weight
- 0.997 = density of water at 25°C

OR

(5) $\frac{\text{Total Pounds of Solvent}}{\text{Total Gallonage} - \text{Gallonage of Water}} = \text{Pounds/Gallon} = \text{VOC}$

*To convert grams per liter to pounds per gallon VOC, multiply VOC g/L by 8.345 x 10⁻³ or divide by 119.8.

Looking back in time, Silberline offered aluminum pigments which were treated with surfactant to make them water miscible in aqueous systems. These were marketed under the treatment of "WD" (water-dispersible) aluminum pigments. While they, as a family, offered water dispersibility, they were not passivated to offer long-term package stability. These grades were, and are, used typically in two-pack systems in general industrial and maintenance types of systems.

Not too long after the introduction of water dispersible grades, a newer technology was offered in the marketplace, consisting also of the utilization of surfactants for water miscibility, but in addition a volatile corrosion inhibitor was incorporated into the paste, providing a synergistic effect, which offered improved resistance to gassing over time. The volatile corrosion inhibitor used comes from the class of nitroparaffin solvents. These grades were marketed to the general industrial and maintenance markets under the trade name

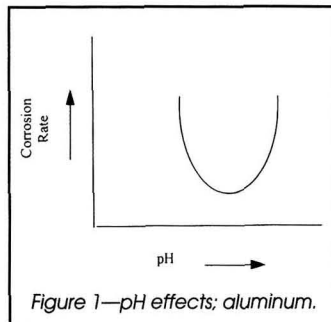


Table 2—Waterborne Starting Point Formulations Based on Joncryl 537^a

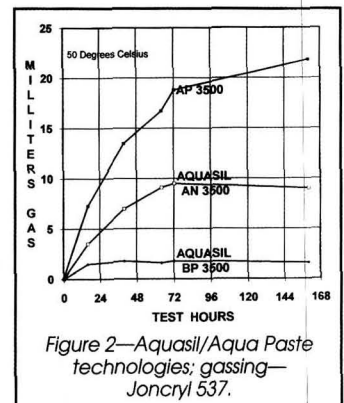
	Gallons	Pounds
Aluminum premix		
Silberline Aquasil BP 3500	3.98	49.43
Butyl cellosolve	6.87	51.59
(Ethylene glycol monobutyl ether)		
Texanol	0.32	2.50
Main batch vehicle		
Joncryl 537	66.68	583.48
DPM	3.28	26.00
(Dipropylene glycol methyl ether)		
Add premix, then add		
Deionized water	16.42	136.78
Patcofe 519	0.28	1.91
DC 14	0.17	1.15
	98.00	852.84
Theoretical weight/gallon	8.70	
Theoretical non-volatile/weight	35.14	
Pigment/binder ratio	0.1/1.0	
pH	8.67	
VOC	2.32 lb/gal	
	(277 g/L)	
Viscosity	21 sec #4 Ford cup @ 73 °F	

(a) Joncryl is a registered trademark of Johnson Wax.

of Hydro Paste™ grades. Not too long after the introduction of Hydro Paste grades, further technological improvements were made in the passivation of aluminum pigments. Utilizing phosphate chemistry, the surface of the flake was treated to provide much longer-term package stability in terms of hydrogen gas evolution. This family of pigments, Aqua Paste™ inhibited aluminum pigments finds uses also in the general industrial and maintenance markets, as well as the roof coating market. This passivated aluminum pigment technology, offering greatly reduced potential to hydrogen gas evolution while at the same time retaining maximum brilliant metallic effects, was widely accepted in these markets. However, the need for a more universal passivated aluminum pigment continued to be requested from the marketplace.

To better understand the passivation process, one needs to understand the basic properties pertaining to aluminum metal itself. Aluminum metal found naturally will have an aluminum oxide layer chemically bonded to the surface of the metal several angstroms thick. Aluminum metal has a tremendous affinity for oxygen and only will be found in nature in this state. Looking at the surface of an aluminum flake, this is the first layer that we find on the flake. After the manufacturing or milling process, we find a second layer consisting of a fatty acid used in the milling pro-

cess. This can be either oleic acid, in the case of non-leaving aluminum pigments, or stearic acid, if leaving type pigments are manufactured. Surrounding the aluminum metal, aluminum oxide, and fatty acid layers is the solvent carrier or solvent phase—typically mineral spirits or other aliphatic solvent. It is this combination that needs to be fully passivated or protected from attack, not only by water, but acids and alkali materials as well. In addition to the reaction of aluminum with water, as shown in the following, which can generate a substantial amount of hydrogen gas in a relatively short period of time, one has to deal with the amphoteric nature of the metal itself.



In a strongly acidic media, the aluminum corrosion process will involve proton reduction at cathodic sites on the aluminum surface and liberate hydrogen gas. Under alkaline conditions, the cathodic reaction site will liberate hydrogen and the aluminum ion complexes with the hydroxyl ion to produce a water-soluble aluminum species. Thus, it can be seen that the pH of the paint or coating ideally should be held as closely to neutral as possible. In actuality, there are two ways to chemically control corrosion, including maintaining the pH at the appropriate level or adding inhibitors. Control of pH can be very effective, but it is not uncommon that the pH required for corrosion control results in poor product performance. Typically, most of today's waterborne systems are formulated for performance within a range of pH between 8 to 9. Levels much lower or higher than these can cause stability and performance problems.

Aluminum metal is known to resist corrosion in some cases, because of its ability to form an aluminum oxide layer on the surface of the metal. This layer can be an effective barrier between the metal surface and the aqueous environment. However, aluminum oxide is soluble in both acidic and alkaline systems. When exposed to either environment the layer can dissolve and the metal will typically react; hence, the control of pH in the formulation is of importance. The relationship between corrosion rate and pH in the formation of this aluminum oxide layer is parabolic in nature, as illustrated in Figure 1. There is a range in which the aluminum oxide layer does contribute to the protection of the aluminum metal itself from reaction.

Further enhancing this natural ability of aluminum metal to form an oxide layer is the incorporation of several types of passivation chemistries, such as the previously discussed phosphate chemistry.

Many other manufacturers have been conducting extensive research, looking for improved methods of passivation of the aluminum flake. Surprisingly, there are several different types of corrosion inhibitors, two of which are passivating and film-forming inhibitors. Film forming inhibitors form barriers between the metal surface and the aqueous environment, and can be organic or inorganic. Organic film-forming inhibitors are long chain molecules with a polar end that adsorbs on the metal surface and an organic end which is present in the aqueous environment to repel it. Examples of such inhibitors would be phosphates. Inorganic film forming inhibitors precipitate an insoluble layer on the surface of the metal and include compounds such as silicates.⁵

Recently introduced into the marketplace is the Aquasil™ family of passivated aluminum pigments. At the present time, two new distinct passivation chemistries have been utilized in the development of Aquasil AN type pigments, as well as Aquasil BP type pigments. The Aquasil AN technology uses phosphate chemistry, as referenced in U.S. Patent No. 5,215,579.⁶ The Aquasil BP technology uses unique passivation chemistry, as referenced in U.S. Patent No. 5,348,579.⁷ Both of these chemistries offer substantially reduced tendencies for the evolution of hydrogen gas in many different types of resin systems.

The two new patented Aquasil technologies provide additional passivated chemistries for the formulator involved with aqueous aluminized coatings formulations. The following four starting point formulations illustrate the use of these technologies in general industrial and maintenance coatings.

The formulation illustrated in Table 2 shows a starting point formulation based on Johnson Wax's Joncryl 537 (a waterborne general industrial acrylic). Viewing this formulation, we see that a pre-mix is prepared utilizing the Aquasil BP 3500 which is slurried with butyl cellosolve. This, in turn, is added to the main batch portion of the formulation which contains Joncryl 537 and dipropylene glycol methyl ether. A small adjustment is made after the pre-mix,

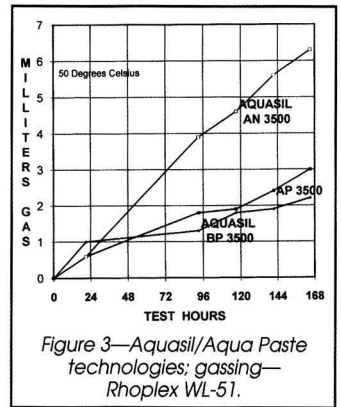


Figure 3—Aquasil/Aqua Paste technologies; gassing—Rhoplex WL-51.

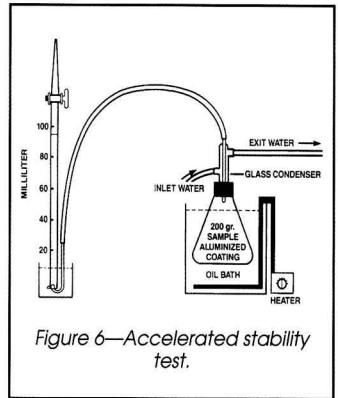
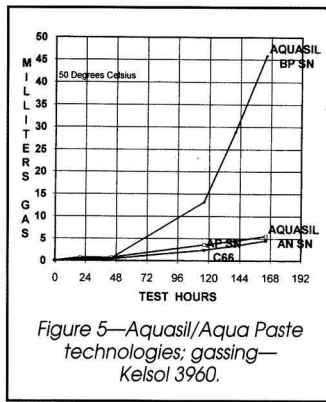
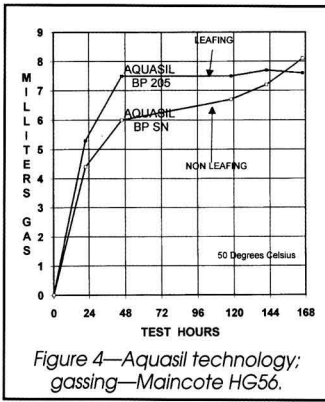
utilizing deionized water, Patcote 519 and DC14. The additives provide flow and leveling characteristics to the formulation. It is important to realize that the creation of this formulation is done under low speed agitation, preferably with paddle-type mixing apparatus. High-speed dispersing equipment causes flake damage and loss of aesthetics.

Figure 2 shows the results of the 168 hr, 50°C, hot oil bath testing, with Aqua Paste 3500, Aquasil AN 3500, and Aquasil BP 3500. It can be seen from this table that the Aquasil BP 3500 offers the lowest tendency toward gassing, at approximately 2 ml. The Aquasil AN 3500

Table 3—Waterborne Starting Point Formulations Based on Rhoplex WL-51^a

	Gallons	Pounds
Aluminum premix		
Silberline Aquasil BP 3500	3.84	47.66
Butyl cellosolve	2.37	17.80
(Ethylene glycol monobutyl ether)		
Butyl carbitol		
(Diethylene glycol monobutyl ether)	3.18	25.30
Main batch vehicle		
Rhoplex WL-51	71.27	612.90
Water	8.40	70.00
Butyl cellosolve	10.23	76.80
(Ethylene glycol monobutyl ether)		
Dibutyl phthalate	1.45	12.70
Add premix, then add		
Patcote 519	0.06	0.40
BYK 301	0.31	2.50
	101.11	866.06
Theoretical weight/gallon	8.57	
Theoretical non-volatile/weight	34.44	
Pigment/binder ratio	0.1/1.0	
pH	7.44	
VOC	2.80 lb/gal	
	(366 g/l)	
Viscosity	31sec #4 Ford cup @ 74°F	

(a) Rhoplex is a registered trademark of Rohm and Haas.



shows 8 ml of gas produced, while the older Aqua Paste technology is approximately 2 ml.

This particular formulation has a VOC of 2.32 lb/gal with a package viscosity of 21 sec, No. 4 Ford Cup.

In reviewing the second starting point formulation, using Rohm and Haas' Rhoplex WL51, which is a waterborne acrylic designed for industrial coatings on both metal and plastic substrates, it can be seen that the incorporation methods are similar to that of the previous formulation. A simple pre-mix is prepared utilizing Aquasil BP 3500 with butyl cellosolve and butyl carbitol as co-solvents. This, in turn, is then added to the main batch under low agitation, followed by the addition of two flow and leveling additives—Patcote 519 and BYK 301. The gassing results utilizing the Aquasil AN and BP technologies, as well as the older Aqua Paste technology are

shown in Figure 3. It can be seen that the Aquasil BP 3500 offers the lowest gassing at approximately 2.2 ml, whereas here it can be seen that the older technology performs very well, offering gassing results at 3 ml, while in turn the Aquasil AN 3500 is a little higher at slightly over 6 ml. This particular formulation has a VOC of 2.8 lb/gal with a package viscosity of 31 sec, No. 4 Ford cup.

Another starting point formulation based on Rohm and Haas' Maincote HG56, a waterborne acrylic designed for industrial maintenance coatings, is prepared in a slightly different manner than the previous two formulations. Here, it is interesting to note that the Aquasil BP 205 which is an ASTM Class B leafing aluminum, is simply slurried in water during the pre-mix process. In the pre-mix the Maincote HG56 acrylic resin is added until a pourable consistency is obtained, which can be transferred to

the main batch. The resin is then added to the formulation. Additional Texanol is added, followed by some ammonia, a foam control agent (Tego Foamex 825), along with some additional co-solvent, methyl carbitol, and finally QR708, which is used to control viscosity. The resulting pH of this formulation is 8.4 with a VOC of 2.01 lb/gal. The package viscosity is 21 sec, #4 Ford cup. This is a single package maintenance type formulation. This particular formulation offers excellent appearance, and can be made *in situ*. The formulation is referenced in Table 4.

The accelerated gassing test is shown in Figure 4. It can be seen that the relative gassing obtained is low at slightly below 8 ml. Also shown in this table is a non-leafing general industrial type aluminum pigment, Aquasil BP SN. The gas results for this particular formulation are approximately 8 ml.

The last formulation shown in Table 5 is based on Reichhold Chemical's Kelsol 3960, which is a chain-stopped water-reducible alkyd. This alkyd can be used in the general industrial as well as the maintenance coating market. This particular formulation shows the use of Aquasil AN SN, which is a general industrial, non-leafing type of aluminum pigment. As in the first two formulations, the aluminum pigment is first prepared as a pre-mix utilizing butyl cellosolve as the co-solvent. The main batch containing the Kelsol 3960 resin, the manganese and cobalt driers, along with Active 8, and finally water is adjusted to a pH of 8.3 with ammonium hydroxide. The pre-mix is then added to the homogeneous mixture. The VOC of this air-dry coatings system is 3.34 lb/gal. The resulting viscosity is 61 krebs units.

Figure 5 shows the relative gassing utilizing Aqua Paste SN, as well as Aquasil BP SN and the Aquasil AN SN as illustrated in the Kelsol 3960 formula-

Table 4—Waterborne Starting Point Formulations Based on Maincote HG 56^a

	Gallons	Pounds
Aluminum premix		
Silberline Aquasil BP 205	11.13	144.53
Deionized water	11.84	98.63
Maincote HG 56	73.76	624.75
Texanol	4.74	37.56
Ammonia 28 .....	.59	4.50
Tego Foamex 825 .....	.36	3.00
Methyl carbitol	5.80	49.36
QR708 (10%) .....	.24	2.00
	108.46	964.33
Theoretical weight/gallon	8.89	
Theoretical non-volatile/weight	43.73	
Pigment/binder ratio	0.26/1.0	
pH	8.43	
VOC	2.01 lb/gal (241 g/L)	
Viscosity	21 sec #4 Ford cup @ 73 °F	

(a) Maincote is a registered trademark of Rohm and Haas.

Table 5—Waterborne Starting Point Formulations Based on Kelsol 3960^a

	Gallons	Pounds
Aluminum premix		
Butyl cellosolve	7.117	53.45
Silberline Aquasil AN SN	7.007	92.21
Main batch vehicle		
Kelsol 3960	27.607	234.11
Mang. hydrocure II 8% .....	.387	3.27
Cobalt hydrocure II 5% .....	.715	5.47
Active 8 .....	.271	2.14
Water	54.220	451.65
Adjust main batch vehicle pH		
Ammonium hydrochloride 28	1.467	11.00
	98.791	853.30
Theoretical weight/gallon	8.64	
Theoretical non-volatile/weight	29.07	
Pigment/binder ratio .....	.326/1.0	
pH	7.2	
VOC	3.34 lb/gal (400 g/L)	
Viscosity	61 KU	

(a) Kelsol is a registered trademark of Reichold Chemicals.

tion. Here it can be seen that the Aquasil BP SN type technology is at a relatively high amount of gas—approximately 45 ml, whereas the Aquasil AN SN type technology is relatively low—around 5 ml. It is also interesting to note that the older Aqua Paste SN type technology offers low gassing at approximately 5 ml, as well. After over one year, the package stability of this particular formulation is very good.

This formulation, serving as a light duty maintenance coating, was applied approximately 18 months ago to solvent storage tanks at the Silberline facility located in Lansford, PA. The system using the Aqua Paste technology continues to perform very well, providing corrosion resistance to the tanks.

In conclusion, it can be seen that the newly introduced Aquasil type technologies offer the formulator additional choices in the coatings development process. A challenge remains for the formulator in that the Aquasil technologies are system-dependent, as shown in earlier results. A wide range of aluminum pigment grades is available in these technologies (see Table 6).

The hydrogen gas accelerated stability test was designed to study the gas generation potential and stability characteristics of any water-based aluminized coating system.⁸ The equipment used for a single set-up is shown in Figure 6. The equipment consists of the following components:

- Wide-mouth, glass Erlenmeyer flask—250 ml capacity.
- Beaker—glass, 250 ml

- Burette—standard glass 100-ml graduated with glass stop cock and 0.2 ml divisions.

- Condenser—glass jacketed, special order.

- Glass tubing—standard glass 1/4-in. (6.35 mm) inside diameter, 5/16-in. (7.94 mm) outside diameter, and 5-in. (127 mm) length for forming the "J" tube.

- Tubing—pure latex amber rubber tubing, 1/4-in. (6.35 mm) I.D., 1/2-in. (12.7 mm) O.D. for hydrogen.

- Neoprene rubber stopper—preferred connection for glass condenser to

250-ml Erlenmeyer flask No. 8 with one hole.

- Oil bath—constant temperature immersion circulating bath capable of temperature control.

- Oil—commercially available mineral oil or suitable heat transfer fluid.

- Thermometer—ASTM thermometer having a range from 30° to 180°F (-2 to +80°C) and conforming to the requirements for thermometer 15°F or 15°C as prescribed in Specification E1.

The procedure for conducting the hydrogen gas stability test is as follows:

—Weigh 200 g of the sample directly into the 250-ml Erlenmeyer flask, assuring that none coats the neck where the stopper is placed.

—Insert the filled flask into the oil bath (temperature controlled to 125°F (51.7°C)) and connect the glass condenser-stopper into the neck of the flask. Flask should be supported internally via flask holder or externally with vinyl-coated, three-pong clamps.

—Fill the 250-ml beaker with water and insert the 100-ml burette and J-tube into the water.

—Draw the water level to the 100-ml mark on the burette and close the stopcock.

—Record the time at the start of the induction period.

—After a one-hour induction period, record the time and the water level point on the burette. The latter figure is the zero point.

—Unless otherwise specified, conduct the test continuously for one week, 168 hr, with a reading taken every 24

Table 6—Aquasil Aluminum Pigment Grades

Silberline Grade	Non-Volatile % by Weight (±2.0%)	Max. % Retained 325 Mesh	D(50%) Microns
Aquasil AN 205	69.6	1.0	—
Aquasil AN SN	72.7	1.0	19.0
Aquasil AN SQ	72.7	2.0	28.0
Aquasil AN 2750	72.7	1.0**	55.2
Aquasil AN 3500	72.7	2.0	31.0
Aquasil AN 3622	81.3	1.0	39.5
Aquasil AN 3641	72.7	1.0	34.2
Aquasil AN 5500	75.0	0.1	18.8
Aquasil AN 5745	72.7	0.1	22.0
Aquasil BP 205	68.0	1.0	—
Aquasil BP SN	63.0	1.0	19.0
Aquasil BP SQ	63.0	2.0	28.0
Aquasil BP 2750	68.0	1.0**	55.2
Aquasil BP 3500	63.0	2.0	31.0
Aquasil BP 3622	76.0	1.0	39.5
Aquasil BP 3641	68.0	1.0	34.2
Aquasil BP 5500	62.0	0.1	18.8
Aquasil BP 5745	62.0	0.1	22.0

hr, at the corresponding time that the zero point was taken.

—If the water level exceeds the confines of the burette, the test should immediately be terminated.

The calculation of the total milliliters of hydrogen gas evolved to the nearest 0.1 ml follows:

$$H = V - Z$$

where:

H = hydrogen gas evolved in milliliter

V = volume of water in burette at 168 hr

Z = zero point volume of water in burette

The search continues in an effort to find additional chemistries which will offer even better stability in aqueous types of formulations, whether they are for the general industrial, industrial maintenance, or OEM automotive and refinish automotive markets.

Acknowledgments

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Characterization of Two-Stage Latexes Using Dynamic Mechanical Thermal Analysis

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INTRODUCTION

Background-Composite Latexes

In an attempt to reduce volatile organic compounds (VOCs), coatings manufacturers, and their customers, are increasingly utilizing water-based technologies. Using emulsion polymers, or latexes, high molecular weight polymeric coatings can be obtained that require minimal amounts of solvent.

With polymeric materials, a wider range of physical and chemical properties is commonly achieved by incorporating several monomers into the polymer backbone. In emulsion polymerization, addition of several monomers often results in an extremely complex polymerization, and a multi-phase, or "composite" latex product. As the name implies, composite particles contain distinct regions, composed of different material. Due to their unique properties, these latexes are often highly desirable.¹

Composite latexes can be produced from either a single or multi-stage emulsion polymerization. In a single-stage emulsion polymerization, copolymerization of monomers with different reactivity ratios results in compositionally heterogeneous copolymers. Early in the reaction, the more reactive monomer preferentially polymerizes, producing a polymer rich in the more reactive monomer. Later in the polymerization, this monomer becomes depleted; and a polymer rich in the less reactive monomer is produced. If these heterogeneous copolymers are incompatible, phase separation occurs resulting in composite latex particles. Typically, "core-shell" morphologies are produced, with the more hydrophilic polymer occupying outer regions of the particles while the more hydrophobic polymer is confined to internal regions.^{2,3} Additionally, composite particles can be produced using two-stage emulsion polymerizations.^{2,4} In the first stage, a hydrophilic "seed" particle is polymerized. In the second stage, this seed is swollen with another monomer(s); and a second polymer is polymerized within the seed. Depending on monomer selection and reaction conditions, a wide variety of particle morphologies can be obtained ("core-shell," "in-

Coatings prepared from two-stage acrylic latexes were characterized using dynamic mechanical thermal analysis (DMTA). The DMTA data, in conjunction with additional supporting data (differential scanning calorimetry (DSC), thermomechanical analysis (TMA), and particle size analysis), provided detailed information on copolymer compositions, latex particle morphologies, and coating morphologies.

Depending on monomer selection and monomer order of addition during polymerization, one of three different particle morphologies was obtained: two particles of different composition, two-phase particles, or interpenetrating polymer network (IPN) particles. Coating performance was highly dependent on latex and coating morphologies, as well as monomer composition. IPN latex morphologies produced coatings with superior mechanical properties and chemical resistance.

verted core-shell," "acorns," "raspberries," etc.).⁴ Particle morphology is controlled by both thermodynamics and kinetics.⁴ If the two polymers are incompatible, phase separation occurs resulting in multi-phase particles, where the more hydrophilic polymer occupies outer regions of the particles. Additionally, particle morphology can be controlled by kinetics. Thermodynamically, incompatible polymers may want to phase separate and/or migrate to a specific area within the particles. However, migration and/or phase separation can be hindered or eliminated by reducing polymer mobility through internal crosslinks^{1,4} or lower reaction temperatures.⁵

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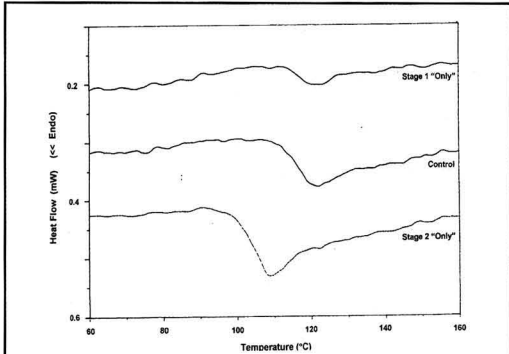


Figure 1—DSC results for Stage 1 and Stage 2 "only" polymers (free film samples).

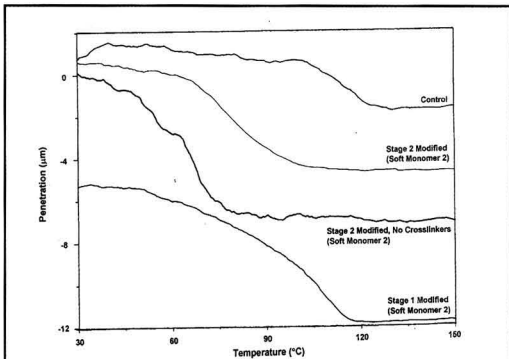


Figure 2—Characteristic TMA results for several experimental coatings.

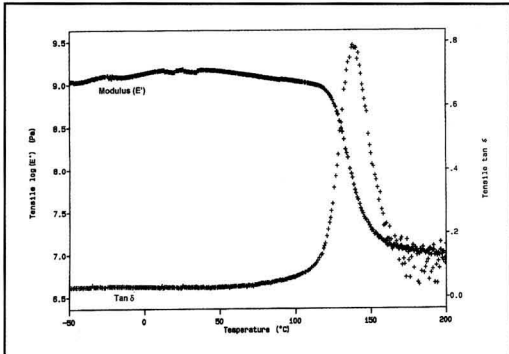


Figure 3—DMTA results for the control latex.

Background Characterization of Latex Morphology Using Dynamic Mechanical Thermal Analysis (DMTA)

DMTA is a powerful polymer characterization technique. Complete discussions of theoretical fundamentals and applications of DMTA have been presented elsewhere.⁶⁻⁸

In a typical DMTA experiment, a small sinusoidal stress is applied to a prestressed polymeric sample; and, the resulting strain is measured as a function of temperature or frequency. Since polymers exhibit some degree of viscoelasticity, measured strains are between 0° and 90° out-of-phase with applied sinusoidal stresses. By quantifying this lag, or phase angle, complex viscoelastic behavior can be separated into elastic [elastic modulus (E')] and viscous [loss modulus (E'')] components. The ratio of the loss and elastic moduli (loss factor, or tan δ) is proportional to damping, or energy dissipated within the material.

Considerable information on structure of a polymeric material can be extracted from the modulus and tan δ data: homopolymer/copolymer glass transitions (T_g); frequency dependence of transitions; copolymer compositions; crosslink densities; number of polymer phases present; assignment of continuous and dispersed phases; and homogeneity of phases present.

In several studies, coalesced latex films have been examined using DMTA.^{1,9-11} In these studies, DMTA data provided information on latex T_g values and copolymer compositions, as well as latex particle morphologies.

In this study, DMTA, and several other supporting techniques were used to characterize coatings produced from extremely complex latexes, synthesized using multiple reaction stages and monomers. This data was used to establish relationships between latex composition, latex structure, coating structure, and coating performance.

EXPERIMENTAL PROCEDURE

Latex Preparation

Two-stage acrylic latexes were prepared using the following procedure. In Stage 1, the reactor was charged with water, acrylic monomers, anionic surfactant, and ammonium hydroxide. This emulsion was stabilized by both the anionic surfactant and neutralized acid monomers (with the ammonium hydroxide). After introduction of the free radical initiator, the monomers were polymerized at 80°C for 2 hr, forming the Stage 1 polymer. Next, a second charge of initiator was added to the reactor, and another mixture of acrylic monomers was added to the reactor over a two-hour period, followed by a two-hour hold. This second monomer mixture formed the Stage 2 polymer. All monomers were converted into a latex polymer with a solids content of approximately 25%.

Latex particles were composed of four different types of ethylenically unsaturated monomers: "hard," or high T_g monomers; "soft," or lower T_g monomers; acid functional monomers; and internal crosslinker monomers. All internal crosslinker monomers were multi-functional,

Table 1—Composition of Experimental Two-Stage Latexes

Latex Variable	Stage 1 Composition	Stage 2 Composition
	35% (Latex Solids)	65% (Latex Solids)
Control	Hard (60%) Acid (40%)	Hard (90%) Internal Crosslinker (10%)
Stage 1 modified	Soft (60%) Acid (40%)	Hard (90%) Internal Crosslinker (10%)
Stage 2 modified	Hard (60%) Acid (40%)	Hard (45%) Soft (45%) Internal Crosslinker (10%)
Stage 2 modified	Hard (60%) Acid (40%)	Hard (50%) Soft (50%)
No internal crosslinkers		

producing polymer network formation through free radical or step-growth polymerization. Generalized latex compositions are summarized in Table 1.

DMTA-Sample Preparation

DMTA required "free" film samples. Acceptable coating free films (0.5-0.8 mil) were obtained using the following procedure. Fully formulated latexes were drawn down on thin aluminum foil (0.25 mil) using a #40 wire bar. All coatings then received an identical thermal treatment: baked at 400°F for 2 min and "slow cooled" to room temperature. After cooling, rectangular samples were cut from the coated foil (approximately 12.5 × 35.0 mm). The coated aluminum samples were then placed in an aqueous copper sulfate solution to remove the aluminum from the coating. After removal of the aluminum, the free films were washed in water, using an ultrasonic bath to remove any residual material. All samples were placed between glass microscope slides, for storage, and dried in a vacuum desiccator.

DMTA-Testing

Free film samples were tested in tension using a Polymer Labs MKIII DMTA unit. Data was obtained from -50 to 200°C at 1 Hz using a heating rate of 5°C/min.

DSC-Sample Preparation and Testing

DSC samples were prepared using two different forms of coating material: free films and resin droplets. Using coating free films, only low sample weights could be achieved (4 to 5 mg), resulting in fairly weak transitions. On the other hand, higher weight samples (7 to 11 mg) were prepared using resin droplets. A small droplet of resin was placed in an aluminum sample pan; and, specimens were then dried slowly (overnight in a laboratory

hood) to maximize contact between the resin and pan. All analysis was performed using a DuPont Instruments Model 912 DSC unit. T_g values were measured using a heating rate of 20°C/min.

TMA-Sample Preparation and Testing

Softening points (T_g) of all free films samples were determined using a TA Instruments 2940 TMA unit at a heating rate of 10°C/min. Softening points were defined as the maximum rate of probe penetration into the coating samples.

Particle Size Analysis

Particle sizes were determined using a Horiba Light Scattering Particle Size Distribution Analyzer.

RESULTS AND DISCUSSION

Coating and latex physical properties are summarized in Table 2. Characteristic DSC and TMA curves are presented in Figures 1 and 2, respectively. DMTA results are presented in Figures 3-7.

Control Latex

For this "hard" latex containing all high T_g monomers and internal crosslinker monomers, mean particle size increased from Stage 1 to Stage 2 of the polymerization (Table 2). This increase indicated that the Stage 1 particles acted as "seeds" for the Stage 2 monomers, resulting in the formation of composite latex particles.

DMTA results from a cured free film of the control latex are presented in Figure 3. Both modulus and $\tan \delta$

Table 2—Physical Properties of Coatings from Two-Stage Latexes (Average Value ± Standard Deviation)

Sample Description	Particle Size (after Stage 1 and Stage 2) (nm)	DMTA T_g (°C)	TMA Softening Point (°C)
Control	1) 120 2) 250	138 ± 2	112 ± 2
Stage 1 modified	1) 191 2) 195	-75 130	104 ± 2
Stage 1 modified	1) 214 2) 253	2 128	106 ± 2
Stage 2 modified	1) 121 2) 342	119	79 ± 2
Stage 2 modified	1) 119 2) 13,580	108	71 ± 2
Stage 2 modified	1) 111 2) 219	81 ± 2 143 ± 1	64 ± 2
No internal crosslinker (Soft monomer 1)			
Stage 2 modified	1) 142 2) 570	52 ± 1 142 ± 1	37 ± 2
No internal crosslinker (Soft monomer 2)			

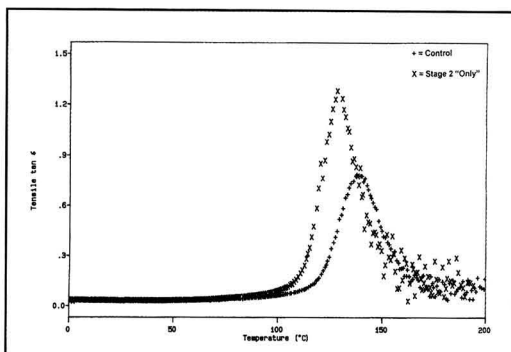


Figure 4—DMTA results for the control and Stage 2 "only" latexes.

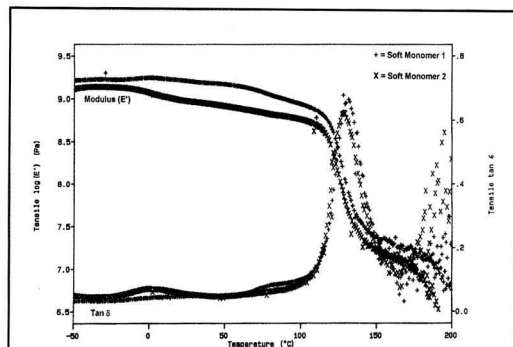


Figure 5—DMTA results for Stage 1 modified latexes (soft monomer).

curves showed a single, narrow transition ($T_g = 138^\circ\text{C}$). This type of DMTA trace usually indicates that the polymer is a fairly homogeneous, single phase material.

Homopolymer T_g values and monomer weight fractions were used to calculate theoretical T_g values of polymers formed during the two-stage polymerization. Theoretical T_g values of the Stage 1 "only" and Stage 2 "only" polymers were substantially different (Table 3). These differences were confirmed by DSC and DMTA experiments on "model," single-stage latexes made from Stage 1 or Stage 2 monomers (Figures 1 and 4, Table 3). It should be noted that the differences between experimental and calculated T_g values are due to the frequency dependence of T_g . Since DMTA is a "dynamic" characterization technique, experimental T_g values are higher than calculated, "static" values.

Two different latex morphologies could explain a single, intermediate DMTA transition for the combination of Stage 1 and Stage 2 polymers. First, Stage 1 and Stage 2 polymers could be miscible, resulting in a blend with a single, intermediate T_g . Second, Stage 1 and Stage 2 polymers may be incompatible; however, incorporation of internal crosslinkers into Stage 2 may have resulted in a microheterogeneous, or IPN, particle morphology. An IPN is an intimate polymer mixture, where a network polymer(s) is formed in the presence of another polymer.^{12,13} In an IPN, the individual polymers may be incompatible; however, crosslinking one or both polymers restricts mobility and phase separation, forcing a degree of miscibility between the two polymers.^{1,12,13}

In order to test these theories, an attempt was made to remove all internal crosslinkers from this control poly-

mer. Unfortunately, this latex could not be successfully synthesized, and the previously discussed theories could not be tested. However, analysis of the Stage 1 "only" and Stage 2 "only" polymers provided critical information. These two polymers had different T_g values than the control latex, indicating that some degree of mixing/interaction between the Stage 1 and Stage 2 polymers was present in the latex particles and in the cured coatings.

Latex Modified in Stage 1

In an attempt to increase coating flexibility, latexes incorporating one of two different lower T_g , or "soft," monomers were synthesized. These modifying monomers have homopolymer T_g values of 20°C and -55°C , respectively. DMTA modulus/tan δ curves for Stage 1 modified polymers are presented in Figure 5. Both sets of curves showed two distinct transitions, indicating a two-phase coating morphology was present. Additionally, modulus data was used to determine the relative positions of these two phases within the coatings. DMTA showed that coating remained rigid at temperatures well above the T_g of the softer phase. In fact, these coatings remained rigid to temperatures near the T_g of the harder phase (Table 2). This was true for both Stage 1 modified coatings, indicating that the higher T_g material formed the continuous phase and the lower T_g material was dispersed within this matrix. TMA results supported this theory. In TMA, softening point values are highly dependent on T_g of the continuous phase.^{14,15} Softening points (Figure 2 and Table 2) of the control and of both Stage 1 modified coatings were almost identical, again indicating that the higher T_g material formed the continuous phase.

Particle size data provided additional details on the latex and coating morphologies. Contrary to the previous case, Stage 1 and Stage 2 particles were nearly identical in size, indicating that the Stage 1 particle did not act as "seeds" for the Stage 2 polymerization. Thus, at each stage of the reaction, separate particles were formed, resulting in

Table 3—Experimental and Theoretical T_g Values for Stage 1 and Stage 2 Only Polymers

Sample Description	DMTA T_g ($^\circ\text{C}$)	DSC T_g "Free" Film ($^\circ\text{C}$)	DSC T_g Resin ($^\circ\text{C}$)	Theoretical T_g ($^\circ\text{C}$)
Control	138 \pm 2	115 \pm 2	104 \pm 1	-109
Stage 1 only	—	115 \pm 2	126 \pm 2	-121
Stage 2 only	129	102 \pm 1	103 \pm 1	-103

Table 4—Effect of Latex/Coating Microstructure on Coating Performance

Coating Modification	Latex Microstructure	Coating Microstructure	Coating Flexibility ^a	Coating Resistance ^b
Control	IPN	IPN	Pass	Pass
Stage 1 modified	Mixture of hard and soft-acid particles	Cont. phase-hard Disp. phase soft-acid	Fail	Fail
Stage 2 modified	IPN	IPN	Pass	Pass

(a) Falling Weight Impact Test. Failure determined from change in coating electrical resistance.
(b) Water (low pH) Immersion Test. Failure determined from change in coating electrical resistance.

a latex containing a mixture of soft and hard particles. Coalescence of these two particle types produced two-phase coatings. Hard Stage 2 particles, the major component in the mixture (65%), formed the coatings' continuous phase, while soft, Stage 1 particles formed the dispersed phase.

DMTA T_g data supported this two-particle theory. For coatings from Stage 1 modified latexes (low T_g monomers), hard phase T_g values (130° and 128°C, for the two different modifying monomers) were identical to the T_g of Stage 2 only coatings (128°C). Thus, coating hard phases were composed of the Stage 2 monomers. Additionally, soft phase T_g values were close to theoretical values for Stage 1 copolymers, consisting of only the acid functional monomer and the low T_g modifying monomer.

Coatings from two-phase particles could have also produced similar T_g values. However, if two-phase particles were present, the observed coating continuous and dispersed phases should have been inverted. The acid copolymers would be expected to occupy outer regions of the particles, while the hydrophobic Stage 2 polymer would be stabilized in particle cores.⁴ Coalescence of these particles would produce a "soft" continuous phase and a "hard" dispersed phase, the opposite of what was observed experimentally.

Latexes Modified in Stage 2

Soft monomers were incorporated into the latex particles by substituting the same low T_g monomers used previously into Stage 2 of the polymerization. DMTA modulus/ $\tan \delta$ curves are presented in Figure 6.

Stage 2 substitutions produced completely different particle and coating morphologies. In these cases, cured coatings had a broad T_g , indicating that the polymer consisted of a single, fairly heterogeneous phase. DMTA and TMA results both showed that Stage 2 substitutions substantially lowered polymer T_g values (Table 2). Latex particle sizes also differed from the previous example. Particle size (Table 2) increased from Stage 1 to Stage 2, again indicating that Stage 1 particles acted as "seeds" for the Stage 2 polymerization.

Several particle morphologies could have produced the observed coating microstructures. First, particles with a wide range of compositions, and resulting T_g values, could be synthesized in the polymerization. Coalescence of these different particles would produce a fairly het-

erogeneous coating with a broad T_g . Second, particles of identical composition could be formed. In one scenario, the Stage 1 and Stage 2 polymers could be compatible, resulting in particles and coating films with a single, intermediate T_g value. In a second scenario, the Stage 1 and Stage 2 polymers may be incompatible. In this case, internal crosslinking within the particles could inhibit phase separation, resulting in an IPN particle morphology with a single, broad T_g .

Latexes Modified in Stage 2 with Soft Monomers and No Crosslinkers

In these resins, the high T_g , hard monomer in Stage 2 of the polymerization was replaced with the same low T_g monomers as described in the previous section. Additionally, all internal crosslinking monomers in Stage 2 were replaced by hard, non-crosslinking monomers.

Resin particle sizes were similar to the control and those discussed in the previous section. Again, particle size increased from Stage 1 to Stage 2, indicating that the Stage 1 particles acted as seeds for the Stage 2 polymerization.

DMTA modulus/ $\tan \delta$ curves are presented in Figure 7. Removal of the internal crosslinkers drastically changed coating morphologies. The broad, single transitions, seen with the Stage 2 modified coatings, separated into two distinct transitions, indicating that two phases were present in the coatings.

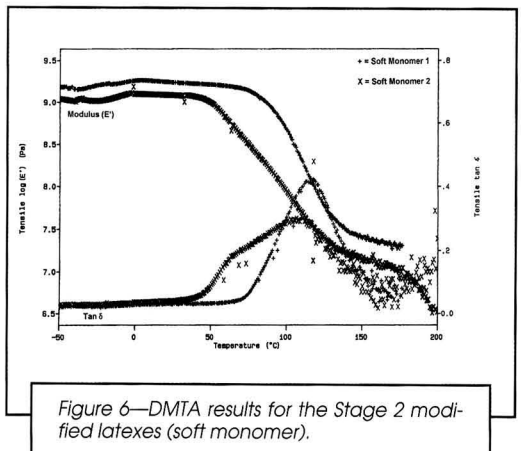


Figure 6—DMTA results for the Stage 2 modified latexes (soft monomer).

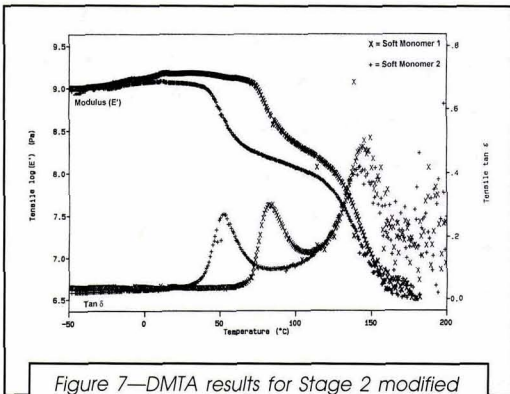


Figure 7—DMTA results for Stage 2 modified latexes (soft monomer, no internal crosslinkers).

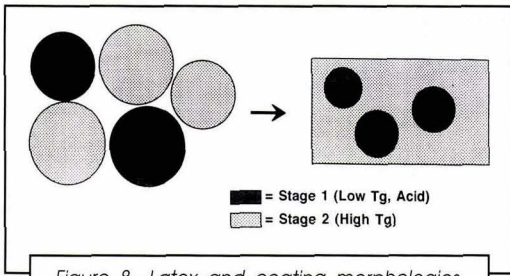


Figure 8—Latex and coating morphologies (Stage 1 modified).

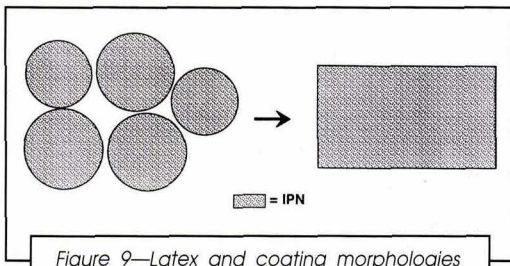


Figure 9—Latex and coating morphologies (control and Stage 2 modified).

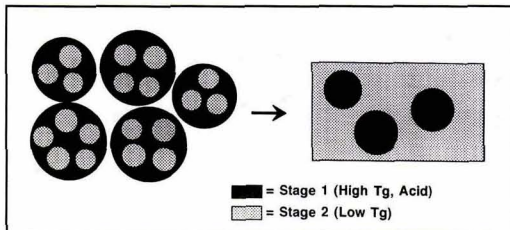


Figure 10—Latex and coating morphologies (Stage 2 modified—no internal crosslinkers).

DMTA and TMA data revealed the relative positions of these two phases within cured coatings. In both cases, coating rigidity decreased drastically at temperatures near the T_g of the softer phase (Table 2). This indicated that the lower T_g material (from Stage 2) formed the continuous phase and the higher T_g material (from Stage 1) formed a dispersed phase. To obtain this coating morphology, a “phase inversion” must have occurred during cure. Since the Stage 1 polymer (hard phase) contained acid functionality, it should have occupied regions of the latex particles, while the hydrophobic Stage 2 polymer (soft phase) occupied interior regions. Without internal crosslinks, these polymers could flow freely at elevated temperatures. Since the lower T_g material (Stage 2) was in excess (65%), it formed the coatings’ continuous phase. Similar inversion behavior has been observed in other latex systems.^{16,17} In latexes with high molecular mobility (low crosslinking densities), the hydrophilic particle shells fragment during coalescence and eventually become dispersed within a matrix of hydrophobic material.

Separation of a single, broad transition into two narrow transitions strongly supported the IPN theory.^{1,13} Apparently, the Stage 1 and Stage 2 polymers were extremely incompatible. However, by polymerizing and crosslinking the Stage 2 polymer within swollen Stage 1 polymer particles, a highly intertwined structure was produced. The thermodynamically driven phase-separation of the Stage 1 and Stage 2 polymers was inhibited by the chain entanglements and chemical crosslinks, forcing a degree of compatibility between the two polymers.

Polymer compatibility may be further enhanced through a second mechanism. In addition to IPN formation, a small amount of grafting may be occurring between the Stage 1 and Stage 2 polymers. Graft copolymer “compatibilizers” are extremely effective in reducing phase separation in blends of incompatible polymers.¹⁸

Structural Models of Latexes and Coatings

Addition of a soft monomer to Stage 1 produced latex particles and coatings with the following characteristics:

- (1) These latexes were composed of a mixture of two distinct particle types. Each type of particle originated from a specific stage in the polymerization. Stage 1 particles had a lower T_g and contained acid functional monomers, while Stage 2 particles had a much higher T_g .
- (2) In the cured coatings, these particles coalesced to form two-phase coatings.
- (3) In the cured coatings, the higher T_g polymer (from Stage 2) formed the continuous phase while the lower T_g material (from Stage 1) formed the dispersed phase.

A schematic diagram describing particle and coating morphologies is presented in Figure 8.

On the other hand, addition of a soft monomer to Stage 2 produced entirely different particle and coating morphologies. In this case, the two-stage polymerization produced latex particles and coatings with the following characteristics:

(1) Polymerization produced only one type of latex particle. These particles contained two incompatible copolymers. However, phase-separation within the particles was inhibited by internal crosslinks, resulting in an IPN-type particle morphology.

(2) IPN particles had a single, broad intermediate T_g .

(3) After coalescence and cure, these particles were still structurally intact within the coatings.

A schematic diagram describing particle and coating morphologies is presented in Figure 9. Additionally, the experimental data indicated that control particles also had this morphology.

Lastly, addition of a soft monomer to Stage 2, while simultaneously removing the internal crosslinkers, produced particles and coatings with the following characteristics:

(1) Polymerization produced a single type of latex particles. In this case, the copolymers formed in Stage 1 and Stage 2 were incompatible, resulting in two-phase particles.

(2) Within these particles, the higher T_g polymer (Stage 1) formed the continuous phase while the lower T_g polymer (Stage 2) formed the dispersed phase.

(3) From these particles, two-phase coatings were produced. However, during cure, a phase inversion occurred, resulting in coatings with a continuous phase composed of the lower T_g material (Stage 2) and a dispersed phase composed of the higher T_g material (Stage 1).

A schematic diagram describing particle and coating morphologies is presented in Figure 10.

Coating performance was highly dependent on particle and coating morphologies. Performance data is summarized in Table 4.¹⁹ For a given monomer composition, the IPN morphology produced optimum coating flexibility and resistance.

CONCLUSIONS

DMTA was used to characterize coatings produced from two-stage latexes. From this, and other supporting data (TMA, DSC, and particle size analysis), several conclusions were made:

(1) For complex emulsion polymerizations, containing several monomers and reaction stages, DMTA provided detailed information on latex and coating structures/morphologies.

(2) Depending upon the monomer feed, these two-stage polymerizations produced several different particle morphologies: two particles of different composition, IPN particles, or two-phase particles.

(3) Coating performance was highly dependent on latex morphology, with the IPN morphology producing superior properties.

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Aqueous Dispersions for Ultraviolet Light Curable Coatings

Z. Jeffrey Wang, Jo Ann Arceneaux, and Jodi Hall—UCB Chemicals Corp.*

INTRODUCTION

Radiation-curable, waterborne products are experiencing rapid growth in the marketplace as a result of both technological advances and increasing environmental pressures to reduce volatile organic compounds (VOCs). These products not only maintain the performance and VOC advantages over the use of conventional solvent-based resins, but also present novel design opportunities because aqueous systems decouple the polymer or oligomer molecular weights from the formulating viscosity. These advantages for many industrial applications have been discussed previously in the literature.¹⁻³

Recently, we have dispersed several types of radiation-curable oligomers in water in our R&D laboratory. These oligomers include acrylated epoxides, acrylated urethanes, and acrylated polyesters. In this paper, the physical and rheological properties of these dispersions will be presented. In comparison, the properties of the coatings made from the undispersed resins will also be described. (Selected dispersions are available from UCB as experimental products).

EXPERIMENTAL SECTION

The oligomers (urethane acrylates, epoxy acrylates, and polyester acrylates) were dispersed in deionized water using appropriate surfactants. In general, the resulting dispersions were about 65% solids. Dispersion viscosity was measured at 25°C using a Brookfield™ (model DV-II) viscometer. The particle size and particle size distribution of the dispersions were also observed using light scattering or microscopic techniques.

Darocur™ 1173 (4 pph on solids; available from Ciba-Geigy) as a photoinitiator was added to the dispersion or resin system and mixed until homogeneous. Approximately 4-6 mil films were then drawn down on Parker Bonderite 40 steel panels. For the dispersion-based coatings, the water was evaporated by heating the sample with a heat gun or infrared lamps until the film cleared. The panels were then cured in air using one or two 300 watt/inch mercury vapor electrodeless lamps, at the maximum belt speed that gave a tack-free

Aqueous dispersions of ultraviolet light (UV) curable resins have been prepared and evaluated. The physical and rheological properties of these dispersions have been determined, and the performance of these dispersions in coating systems has been studied. Coatings based on these dispersions have faster UV cure speed, better surface hardness, and better flexibility compared with coatings based on undispersed resins.

film. The properties of these films were then tested according to the following ASTM⁴ methods: adhesion (ASTM D 3359), hardness (ASTM D 3363), flexibility (ASTM D 522 and ASTM D 2794), and gloss (ASTM D 523). In addition, methyl ethyl ketone (MEK) and water resistance were determined using the double rub method (ASTM D 4752).

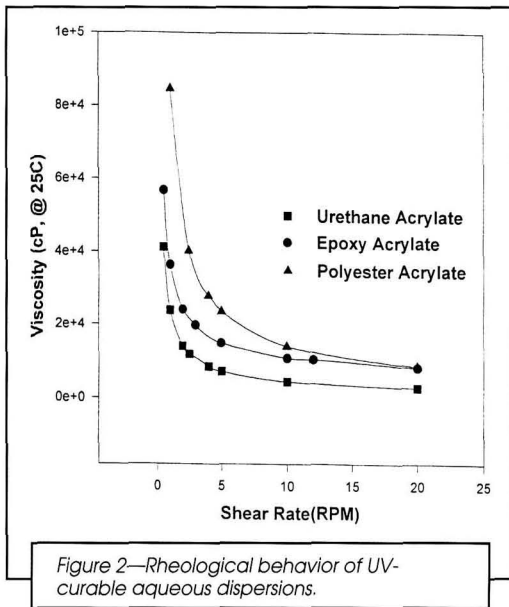
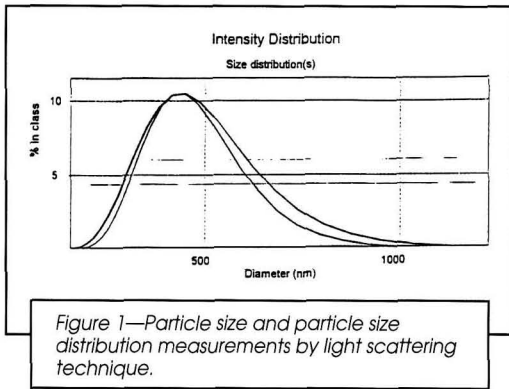
RESULTS AND DISCUSSION

Several widely used types of radiation-curable oligomers have been successfully dispersed in water. Chemically, these oligomers include acrylated epoxides, aromatic and aliphatic urethane acrylates, and acrylated polyesters, all of various functionality. Rheologically, these oligomers vary in viscosity from 80 cps to greater than 1,000,000 cps at room temperature.

Particle Size

These dispersions were characterized by their particle size and particle size distribution. In most cases, the particle size of the dispersions prepared in our laboratory fell between 0.1 μm and 2.0 μm . The particle size distribution can vary within this range depending on the chemical and physical properties of the oligomers. As an example, the dispersion of an acrylated epoxy oligomer has an average particle size of 0.45 μm (see Figure 1).

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Rheological Behavior

Flow properties of the aqueous dispersions were determined. The viscosities of the dispersions (at about 65% solids) vary over a wide range of 1,200 to 10,000 cps at 25°C. The experimental investigations indicate that viscosity is closely related to the particle size and particle size distribution of the dispersions. For those dispersions containing the same percentage of water, the smaller the average particle size, the greater is the viscosity. It is also clear that, under otherwise identical conditions, the viscosity of a dispersion increases with the increasing volume content of the dispersed phase, i.e., the oligomer phase. It is important to point out here that all dispersions evaluated to date in our laboratory have pseudoplastic rheological behavior. The dispersion viscosity decreases with increasing shear rate, but returns to its original value immediately after removal of the shear stress. Figure 2 illustrates this pseudoplastic rheological behavior for three types of dispersions: dispersion of acrylated urethane oligomer, dispersion of acrylated epoxy oligomer, and dispersion of polyester acrylate oligomer.

Stability

Long-term and accelerated stability testing have been assessed for many of these dispersions. In general, most of these dispersions are stable at room temperature for at least six months, with no phase separations and no significant particle size changes. The majority of these dispersions also pass thermal testing at 60°C for three days without phase separation or particle size changes. Several of these dispersions pass 1-3 freeze/thaw cycles, also without phase separation or particle size changes. Work continues in this area to provide even better stability.

Film Performance

The properties of the films based on the aqueous dispersions have been investigated. These properties are summarized in Tables 1-4 for four different types of films. As a typical example, we will discuss the results in Table 1, which contains the properties of the film made from the dispersion of an acrylated epoxy oligomer. For comparison purposes, the properties of films

Table 1—Properties of Films Based on Acrylated Epoxy Oligomer^a

Property	Dispersion (in 35% Water)	Oligomer (in 45% TRPGDA)	Oligomer (neat)
Viscosity (cps, 25°C)	4120	4270	>1,000,000
Cure speed (fpm)	200	100	100
Lamps (H lamp, 300 wpi)	1	2	2
Adhesion (%)	100	66	61
Pencil hardness	9H+	9H+	4H
Conical bend (inches of crack)	0	0	0
Reverse impact (In lbs)	6	2	0
MEK double rubs	200+	200+	200+
Water double rubs	200+	200+	200+
Gloss ^b (60°)	100	104	107

(a) Formulation: 100 parts acrylate: 4 parts Darocur™ 1173 (based on solids), -5 mils film on Bonderite.
 (b) Average of three readings.

Table 2—Properties of Films Based on Amine Modified Acrylated Epoxy Oligomer^a

Property	Dispersion (35% Water)	Oligomer (neat)
Viscosity (cps).....	3,160 at 25°C	1100-1600 at 65°C
Cure speed (fpm, 1 H lamp, 300 wpi)....	200	200
Adhesion (%).....	100	100
Pencil hardness.....	9H+	9H+
Conical bend (inches of crack).....	0	0
Reverse impact (in lbs).....	14	4
MEK double rubs.....	200+	200+
Water double rubs.....	200+	200+
Gloss ^b (60°).....	98	110

(a) Formulation: 100 parts acrylate: 4 parts Darocur™ 1173 (based on solids), -5 mils film on Bonderite.

(b) Average of three readings.

Table 3—Properties of Films Based on Acrylated Aromatic Urethane Oligomer^a

Property	Dispersion (35% Water)	Oligomer (neat)
Viscosity (cps, 25°C).....	2,200	24,500-32,500
Cure speed (fpm, 1 H lamp, 300 wpi)....	150	150
Adhesion (%).....	100	100
Pencil hardness.....	9H+	4H
Conical bend (inches of crack).....	0 ^c	0 ^c
Reverse impact (in lbs).....	0	0
MEK double rubs.....	200+	200+
Water double rubs.....	200+	200+
Gloss ^b (60°).....	99	103

(a) Formulation: 100 parts acrylate: 4 parts Darocur™ 1173 (based on solids), -5 mils film on Bonderite.

(b) Average of three readings.

(c) No cracking, but lack of adhesion.

made from neat acrylated epoxy oligomer and from acrylated epoxy oligomer diluted with tripropylene glycol diacrylate (TRPGDA) monomer are also listed in Table 1.

The viscosities of the dispersions are much lower than those of the undispersed oligomers. Also, the viscosity of a dispersion can be easily adjusted to meet the requirements of an application technique through the addition of more deionized water. This type of dilution does not typically affect the stability or the final properties of the dispersion. Table 1 compares a water and monomer dilution of an epoxy acrylate oligomer with the same viscosity, as well as neat epoxy acrylate oligomer with much higher viscosity.

It was surprising to find that films made from the aqueous dispersions can have faster cure speeds than films made from undispersed oligomers. As we can see from Table 1, the film based on the dispersion has a cure speed of 200 feet/minute with one F-300 H bulb lamp (available from Fusion Systems Corporation). In contrast, the non-aqueous based films have a cure speed of only 100 feet/minute with two F-300 H bulb lamps. It is believed that a water vapor layer is formed on the surface of the film during the drying process. This water vapor layer then acts as an oxygen barrier, and mitigates oxygen inhibition of cure. Consequently, the films based on dispersions can have faster UV cure speed than the films made from undispersed oligomers. (No cure speed differences are seen for those resin systems that were originally designed to give good surface cure, i.e., amine modified epoxy acrylates).

A simple experimental investigation has proved our assumption. No differences in cure speed are seen if the aqueous dispersion based films are dried, and then allowed to sit at room temperature for 30 min to allow the water vapor layer to dissipate. Moreover, the degree of cure of films made from water dispersions and the corresponding undispersed oligomers were measured by FTIR-ATR (attenuated total reflectance) spectroscopy. A peak whose absorbance did not change upon cure was used as an internal reference. The relative change upon cure in acrylate absorbance at 810 cm⁻¹ was noted. The relative change in the 810 cm⁻¹ absorbance was then used to calculate the percent Reacted Acrylate

Unsaturations (% RAU). Percent RAU was 60.0 for "wet films," and 52.0 for "dried films." These results confirm that the level of unreacted double bonds is lower when the films are cured under wet conditions.

It is also interesting to note that films made from dispersions have relatively higher pencil hardness than films made from undispersed oligomers. This improved hardness may be related to better surface cure from the mitigation of oxygen inhibition.

The results of the conical bend and reverse impact tests indicate that the films made from the dispersions have better flexibility than the films made from undispersed oligomers. The cause of this increased flexibility is not clear. One possible reason is that the surfactant and residual water in the films act as plasticizers that flexibilize the films. The increase in adhesion could also be due to this plasticization.

Significantly, unlike many conventional water-soluble polymers, all films made from these dispersions have very good chemical and water resistance. There are only slight differences in the film gloss of dispersions and the film gloss of the corresponding undispersed resins.

Table 4—Properties of Films Based on Acrylated Aliphatic Urethane Oligomer^a

Property	Dispersion (35% Water)	Oligomer (neat)
Viscosity (cps).....	2,488 at 25°C	150-550 at 65.5°C
Cure speed (fpm, 2 H lamps, 300 wpi) ..	150	100
Adhesion (%).....	100	100
Pencil hardness.....	9H+	9H+
Conical bend (inches of crack).....	0 ^c	0 ^c
Reverse impact (in lbs).....	0	0
MEK double rubs.....	200+	200+
Water double rubs.....	200+	200+
Gloss ^b (60°).....	100	87

(a) Formulation: 100 parts acrylate: 4 parts Darocur™ 1173 (based on solids), -5 mils film on Bonderite.

(b) Average of three readings.

(c) No cracking, but lack of adhesion.

CONCLUSIONS

Widely used radiation curable oligomers have been successfully dispersed in water by employing and developing dispersion technology. As expected, the dispersions prepared in our laboratory are much lower in viscosity than the corresponding undispersed resins, and are quite stable. Films based on the dispersions can have faster UV cure speed, better surface hardness, and better flexibility compared with films based on undispersed resin systems. These films also have excellent chemical and water resistance. Further research on the cure mechanisms and properties of radiation curable dispersions and their end use applications are currently underway in our laboratory.

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Factors Affecting Dirt Pickup in Latex Coatings

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Oliver Wagner—BASF AG.

INTRODUCTION

The ability of painted exterior surfaces to remain relatively clean in appearance for long periods of exposure is a major performance issue in architectural coatings. The end user of architectural coatings perceives the primary function to be decorative, therefore, all factors affecting surface appearance dominate the perception of overall coating performance. A pronounced tendency to accumulate dirt can quickly negate any other positive attributes which an exterior coating may possess. Consequently, it is interesting and necessary to understand how coating properties influence dirt pickup.

Influence of Glass Transition Temperature

The characteristics which influence the extent to which a paint film picks up and retains dirt have been listed¹ as hardness, surface tackiness, surface resistivity, thermoplasticity, and gloss. Three of these characteristics are obviously closely interrelated, namely hardness, surface tackiness, and thermoplasticity. The hardness or tackiness of a thermoplastic polymer film at a given temperature is controlled largely by the glass transition temperature (T_g) of the polymer. Latex paints are typically based on thermoplastic polymer. It is generally accepted and confirmed by our work (Figure 1) that for a given polymer type dirt pickup decreases as polymer T_g increases. Figure 1 shows the difference in total reflectance (ΔL CIE-Lab) between exposed and unexposed areas of coated panels after three years vertical exposure in an agricultural/industrial area of central Germany. The panels were coated with 35% PVC white paints containing straight acrylic copolymer latices with T_g values of -20° , 0° , and $+10^\circ\text{C}$.[†] The trend towards increased dirt pickup with decreasing T_g is shown clearly by the decrease in reflectance.

Holbrow² has shown that there is no correlation between hardness and dirt pickup between different coating types, but good correlation does exist for paints based on emulsion polymers. This is easily explained in terms of thermoplastic and non-thermoplastic behavior of resins. If the hardness of the coating is determined at room temperature the relative hardness of thermoplas-

Latex coatings are based on thermoplastic polymer. Their tendency to pick up dirt is greatly influenced by the glass transition temperature of the polymer. However, glass transition temperature is not the only polymer property influencing dirt pickup; hydrophobic modification has been found to be particularly beneficial in textured coatings while monomer selection and crosslinking chemistries have beneficial effects on paints and elastomeric coatings. Good correlation has been found between water sensitivity and water vapor permeability of polymer compositions, and the dirt pickup observed in coatings formulated with them.

tic resins will have a good correlation with their T_g , the lower T_g resins will be tackier at the elevated temperatures experienced during the exposure period and, therefore, show more dirt pickup. A non-thermoplastic resin, such as a solvent-borne alkyd or epoxy, will not become tackier as the temperature increases so the hardness at room temperature is not a good indicator of its propensity to pick up dirt.

Dirt retention is a major concern in exterior textured coatings (synthetic stuccos), these coatings are being employed as the finish coat in the thermally insulating exterior cladding systems known as exterior insulation finishing systems (EIFS). Since these coatings are marketed as integral parts of the exterior cladding system, the expectation for their useful service life is very high. These coatings typically contain between 8% and 15% latex polymer solids on total solids by weight. A three-year vertical south exposure study (Figure 2) shows that at 10% polymer solids, the only polymer property which has a significant influence on dirt retention in textured coatings is MFFT* of the resin, and then only in extreme

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[†] T_g values, throughout the paper, are mid-point measured by differential scanning calorimetry (DSC).

*Resins MFFT = T_g (mid-point DSC) \pm 2°C.

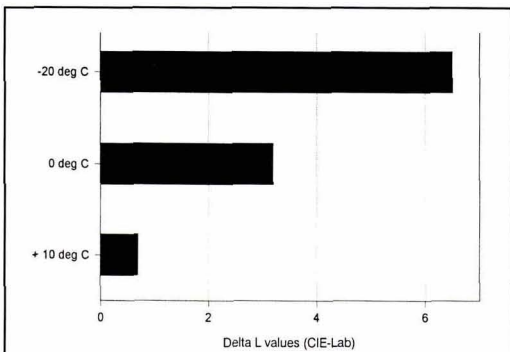


Figure 1—Dirt pickup after three years. Straight acrylic polymers—different T_g ranges.

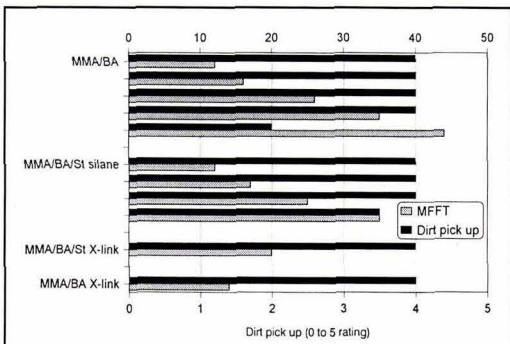


Figure 2—Polymer modifications have no effect at low polymer levels. Three years exposure of a 1.5 mm textured coating.

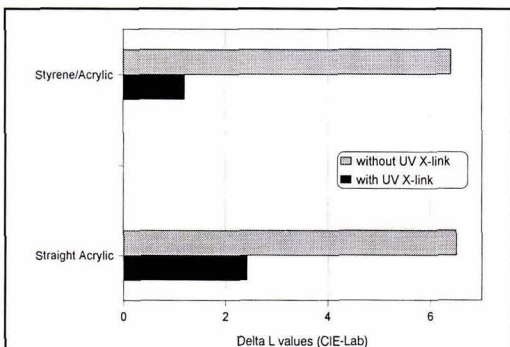


Figure 3—Dirt pickup after three years. Different polymers—low T_g range (-20°).

cases. The other polymer variations, chemical crosslinking, silane modification, and different acrylic monomers had no influence on the dirt pickup. The fact that the more subtle variations in polymer composition had no effect can be attributed to the low polymer content of the coating (textured coatings are formulated well above CPVC), large changes in the polymer properties are required in order to have any noticeable effect at this low level.

Influence of Crosslinking

Ultraviolet photoinitiators can be used as crosslinking agents for exterior latex coatings.³ It has been our experience that this approach is only effective in reducing dirt pickup with low T_g resins in low PVC coatings. Figure 3 shows the effect of adding a UV initiator to low T_g (-20°C) acrylic and styrene acrylic latex in an elastomeric coating. The chart shows the change in total reflectance (ΔL CIE-Lab) between exposed and unexposed areas of the panels after three years of 45°S, the higher the ΔL value the higher the dirt pickup.

UV crosslinking in pigmented architectural coatings has the limitation that is purely a surface phenomenon, the underlying body of the coating is not crosslinked and therefore remains soft. Problems have been experienced with UV crosslinked elastomeric coatings, the crosslinked surface can erode away by chalking to expose the uncrosslinked tacky polymer beneath.³ This has occurred in practice and has resulted in a sudden dramatic increase in dirt pickup as the coating ages. This problem does not occur with chemically crosslinked polymers since the crosslinking takes place throughout the coating, not only at the surface. A very practical approach to the use of UV crosslinkers in elastomeric coatings is to use them in combination with chemical crosslinkers; this ensures that degradation of the surface layer will not result in the exposure of a tacky uncrosslinked surface.

Figure 4 shows from left to right a UV crosslinked coating, a chemically crosslinked coating, and a coating using both UV and chemical crosslinking. All three elastomeric coatings are based on the same acrylic styrene resin which has a T_g of -25°C the coatings were all formulated at 30% PVC. The panels were exposed vertical south for 2.5 years. The combined crosslinking system does result in a significant reduction in dirt pickup.

Influence of Surface Morphology

As previously mentioned, surface resistivity is listed by Holbrow as a property influencing dirt pickup. A surface with high electrical resistance is capable of holding electrostatic charges and electrostatically charged surfaces (e.g., TV screen) have a tendency to attract air born dust and dirt particles. However, Holbrow concludes that this mechanism can only operate in very dry atmospheres since humid air will provide sufficient conductivity to prevent significant charge build-up. We have not found any evidence that surface resistivity is a significant factor influencing the dirt retention of coatings.

It would be anticipated that the surface roughness of coatings would influence dirt pickup, with rougher sur-

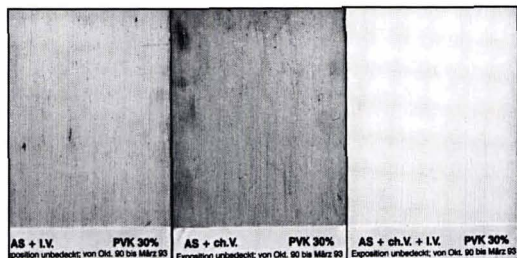


Figure 4—From left to right: UV crosslink coating; a chemically crosslinked coating; and a coating using both UV and chemical crosslinking.

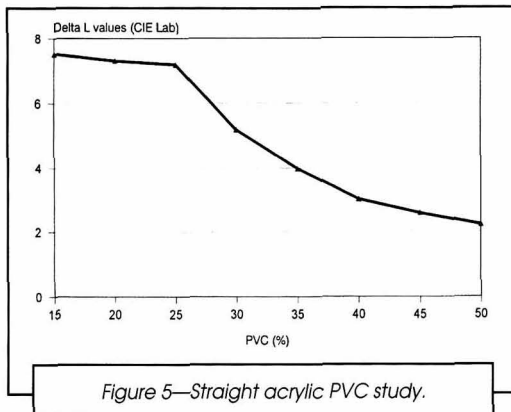


Figure 5—Straight acrylic PVC study.

faces collecting more dirt. It has been shown experimentally, however,² that when all other factors (PVC, resin, pigments, etc.) remain constant and only the roughness is varied by changing the particle size of large aggregates in the coating, the surface roughness does not influence the dirt pickup. This was demonstrated in both latex and alkyd paints. While the surface roughness may not influence dirt pickup in latex paints, PVC certainly does have an influence. Figure 5 shows ΔE values for a PVC ladder in an exterior acrylic house paint after 12 months of exposure at 45°S in Miami, FL. There is a clear trend towards lower dirt pickup as PVC increases. This is consistent with the observation that dirt pickup is caused by the tackiness of the thermoplastic polymer; as the PVC increases the amount of polymer at the coating surface decreases. This observation should not be confused with the well known phenomenon that porous surfaces are more difficult to clean than non-porous surfaces. First of all, the coatings in the PVC ladder did not exceed the CPVC and should not therefore demonstrate porosity. Secondly, no attempt was made to clean the coatings—measurement of ΔL values after cleaning may reveal a different trend.

Reduction of porosity has been employed as a means to reduce dirt pickup. A proprietary treatment⁴ for painted surfaces to effect a reduction in dirt pickup consists of a low viscosity slurry of microfine silica. The paint is washed with the slurry, the theory being that the silica particles fill in the open pores in the paint thereby reducing dirt pickup. Holbrow² found this treatment to be very effective in sand filled latex paints, which are typically very porous as they are formulated well above CPVC.

Mechanism of Dirt Pickup

It has been shown⁵ that the major mechanism for dirt pickup in exterior paints is carriage of the airborne dirt to the painted surface by rainwater. It has also been shown, by passing rainwater through filter paper and observing that it still soils the paint, that the dirt particles carried by rainwater are of colloidal dimensions. Such small particles can be carried by water into the pores in the paint surface. Pierce and Holsworth⁶ have shown that latex paints contain air voids (pores) at all PVC levels, it has also been documented⁷ that even un-

pigmented latex coatings contain pores. It is well known that films made from thermoplastic latex resins are softened by water saturation, so water plays a double role in causing dirt pickup. It carries the dirt to the surface and into the omnipresent pores, as well as softens the polymer making it hold on to the dirt more easily.

Influence of Hydrophobicity

The realization that water plays a significant role in the soiling of latex paints suggests that hydrophobic surfaces should stay cleaner than hydrophilic surfaces. The Paint Research Association⁸ has shown that post treatment of a coating with a five percent solution of a silicone water repellent does result in a significant reduction in dirt pickup. However, incorporation of one percent of the same silicone water repellent into the paint formulation had no noticeable effect. The Norwegian Paint and Varnish Association⁹ has reported con-

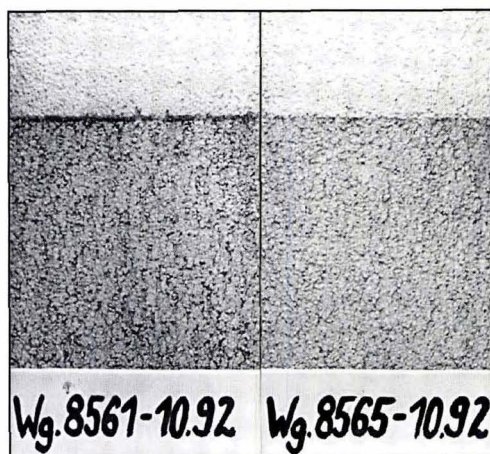
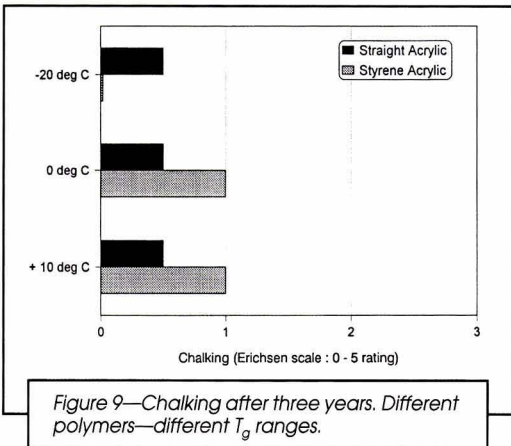
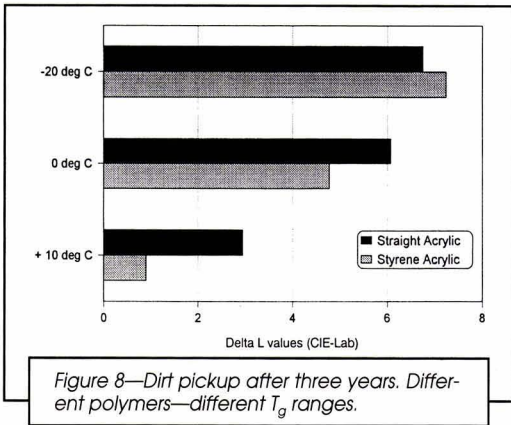
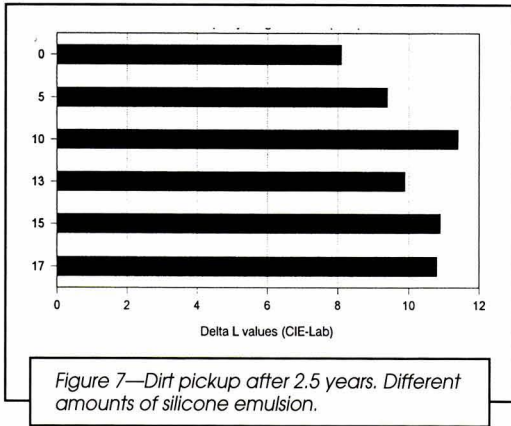


Figure 6—Two textured coating panels after 2.5 years exposure at 45°S. Panel on the left is a traditional styrene/acrylic coating; panel on the right has 33% of the styrene/acrylic copolymer replaced with a silicone emulsion. (Formulations 1 & 2 in appendix.)



tradictory results, observing that hydrophilic paints stayed cleaner than hydrophobic paints. These observations were made on oil-based white house paints and are inconsistent with our observations on latex paints. Figure 6 shows two textured coating panels after 2.5 years exposure at 45°S, one panel is a traditional styrene/acrylic coating, the other has 33% of the styrene/acrylic copolymer replaced with a silicone emulsion (Formulations 1 & 2 in the Appendix). The silicone modified coating shows significantly reduced dirt pickup, which is attributed to the hydrophobic character of the silicone resulting in reduced wet time and reduced water penetration into the porous coating. The fact that the water beads up on the coating surface and cannot wet out and enter the pores prevents the water from carrying the suspended colloidal dirt into the porous matrix of the coating.

We have also evaluated silicone modified paints. Figure 7 shows ΔL values for a series of styrene acrylic latex paints in which silicone emulsion addition was varied from 0% to 17% (Formulation 3 in Appendix). No benefit is seen for modifying the coating with silicone emulsion. These results are not consistent with those seen in the textured coating (Figure 6). This is probably because the paint is much less porous than the textured coating, so it does not derive the added benefit of preventing dirt penetration below the surface. We have, however, noted in the same series of silicone modified paints that algae growth decreased with increasing amounts of silicone. This can be attributed to reduced wet time caused by the hydrophobic silicone. A similar correlation should also exist for mildew growth, but we have not noticed this phenomenon in our work to date.

Our studies show that hydrophobicity and associated rate of water run-off play a significant role in controlling coating cleanliness in textured coatings. The advantages of hydrophobic modification would probably be even more apparent if we had exposed the panels vertically instead of at 45°.

Influence of Monomer Type

Figure 8 shows ΔL values (CIE Lab) for a series of 35% PVC white latex paints after three years vertical exposure. The paints were made with latex resins having two different monomer combinations, a straight acrylic (MMA/BA), and a styrene acrylic (Sty/BA). For each monomer combination, the monomer ratios were adjusted to produce polymers with three different glass transition temperatures, +10°C, 0°C, and -20°C. The trend toward reduced dirt pickup with increasing T_g is clear and consistent for both monomer combinations. More interesting however is the fact that at 0°C and 10°C T_g , the dirt pickup is strongly influenced by the monomer composition, whereas at -20°C all the polymers perform poorly as the resin is too tacky and soft.

One possible reason for the difference in dirt pickup could be chalking. It is well known and reported^{9,10} that moderate controlled chalking can have a beneficial self-cleaning effect in latex paints. However, this was not the case in this exposure series none of the polymers showed any significant chalking (Figure 9). Chalking is rated

using the Erichsen scale of 0 to 5 where 0 is no chalking. The differences in dirt pickup must be associated with other properties which are influenced by the monomer composition.

In order to further investigate the influence of monomer composition on film properties, a series of model dispersions was produced¹¹ which varied from one another only in the nature and amount of the main monomers. In other words, the emulsifying agents, the secondary monomers, the auxiliaries, and the method of production were identical in all cases. Monomer ratios were adjusted to yield roughly the same T_g for each composition. Figure 10 shows the water absorption and water vapor permeability values (ISO DIS 7783 paints and varnishes—determination of water vapor permeability) for these acrylic and styrene acrylic copolymers. Water absorption (DIN 53495 determination of water uptake, Procedure 3) is shown as % weight. Water vapor permeability is expressed as the standard equivalent thickness in meters of stationary air cushion that would yield the same results as a polymer film of 1 g/m² coat weight. The results show that the resistance to diffusion of water vapor rises with an increase in the length of the carbon chain in the alcohol of the acrylic ester employed a corresponding decrease in water absorption is also observed. The values for the water absorbed and the water permeability of the straight acrylic copolymers lie systematically above those for the styrene acrylic copolymers.

These results help to explain the differences in dirt pickup observed with the different monomer combinations in Figure 8. The results are fully consistent with the theory that hydrophobicity reduces dirt pickup. Styrene acrylic copolymers being more hydrophobic than straight acrylic copolymers yield films having lower water take-up, higher resistance to water vapor permeability, and ultimately lower dirt pickup. Concerns over increased chalking and yellowing with styrene acrylics versus straight acrylics are in our experience unjustified at PVC levels of 30% and higher; at low PVC levels straight acrylics do offer advantages. The excellent exterior durability of styrene has also been reported by Stevens¹² who notes that styrene acrylics show no chalking or yellowing disadvantage in exterior house paints when compared with straight acrylic copolymers.

CONCLUSION

Our work indicates that the dominance of styrene acrylics in textured coatings and exterior house paints in Europe, and the emergence of silicone modified textured coatings may be technically justified by the potential of these systems to stay cleaner for longer. Our work also indicates that styrene acrylic copolymers may be better suited to address the requirements for zero VOC

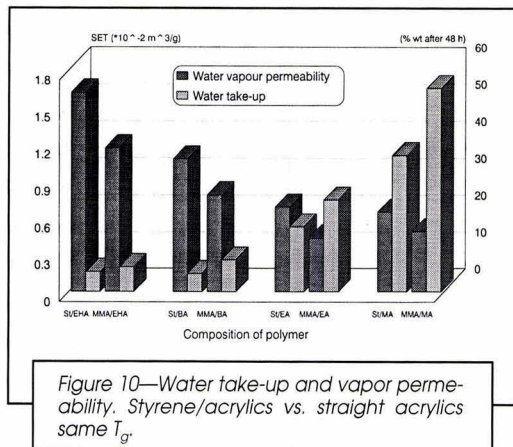


Figure 10—Water take-up and vapor permeability. Styrene/acrylics vs. straight acrylics same T_g .

and elastomeric coatings than straight acrylics, given that both these applications require low T_g polymers which also exhibit a low tendency to pick up dirt.

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Appendix on next page ↔

Appendix

Formulation 1

Styrene Acrylic Textured Coating Parts by Weight

Latex resin (Sty. Acr.) 50%	121
Acrylic thickener 8%	5
Bentonite thickener 4%	28
TKPP, 50%	5
Defoamer	4
Biocide	2
Mineral spirits 180-210°C	9
Coalescent	9
Silicone emulsion 44%	0
Water	60
Titanium dioxide	32
Cellulosic thickener	7
Calcium carbonate	297
Mica	49
Calcium carbonate 1 mm	93
Calcium carbonate 1.5 mm	279
Total	1000

Formulation 2

Silicone Modified Textured Coatings Parts by Weight

Latex resin (Sty. Acr.) 50%	80
Acrylic thickener 8%	5
Bentonite thickener 4%	28
TKPP, 50%	5
Defoamer	4
Biocide	2
Mineral spirits 180-210°C	9
Coalescent	9
Silicone emulsion 44%	80
Water	21
Titanium dioxide	32
Cellulosic thickener	7
Calcium carbonate	297
Mica	49
Calcium carbonate 1 mm	93
Calcium carbonate 1.5 mm	279
Total	1000

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A. Smith



O. Wagner

Formulation 3

Silicone Modified Latex Paint

Water	220.0
Sodiumpolyphosphate	0.5
Dispersant	2.5
Bentonite thickener	1.5
Biocide	1.5
Defoamer	2.0
Titanium dioxide	110.0
China clay	15.0
Mica	30.0
Calcium carbonate	355.0
Latex resin (sty. acr.) 50%	96.0
Silicone emulsion 50%	Variable ^a
Diurethane thickener	8.0
Total	842 + Silicone

(a) Silicone emulsion added = 5%, 10%, 13%, 15%, 17% by weight.

Preparation of UV Curable Emulsions Using PEG-Modified Urethane Acrylates and Their Coating Properties

Myung-Eon Song, Ju-Young Kim, and Kyung-Do Suh—Hanyang University*

INTRODUCTION

Recently waterborne coatings have been widely utilized in industrial coatings. This has made it possible to decrease air pollution, to reduce risks of fire, and to improve aspects of occupational health and safety. Initially, the use of water-soluble, dispersible or dilutable UV or EB curable formulations may appear contradictory from an energy saving viewpoint, because it is necessary to remove the water before irradiating the film. Nevertheless, marked improvements in application viscosity can be achieved by using water without the use of volatile organic solvents. Water-based inks and coatings find widespread usage and are becoming increasingly desirable with the ever increasing environmental pressures.^{1,2}

To prepare a water-dispersible resin, a special treatment or structural modification for polymer or oligomer to improve water dispersibility has been generally done by incorporating hydrophilic groups into the molecular backbone.³⁻⁵ These hydrophilic groups always existed as a pendant group. However, for ionic dispersions a neutralization agent is needed to neutralize acid-functional oligomers, which are very toxic and might release potentially harmful organic amines during a curing process. In case of incorporating nonionic, hydrophilic groups as a pendant group, it was necessary to synthesize a prepolymer with isocyanate end groups and polyoxyethylene pendant groups at the same molecule through complicate reaction processes.⁶

In this paper, PEG-modified urethane acrylates (PMUA) were synthesized by the reaction of poly(ethylene glycol) (PEG), with residual isocyanate groups of a urethane acrylate. These molecules could be prepared by a relatively simple process, and they contained nonionic hydrophilic polyoxyethylene groups not as pendant groups, but rather as terminal groups. In this position, the PEG groups on paint could act as a polymeric surfactant and be emulsified without additional external surfactant.

The ultimate goal of this study was preparation of UV curable emulsions using PMUA. Thus, the effect of the reaction molar ratio of PEG on the emulsion droplet size,

To prepare self-emulsifiable urethane acrylate, PEG-modified urethane acrylates (PMUA) containing polyoxyethylene groups as a terminal group were synthesized by the reaction of PEG [poly(ethylene glycol)] with residual isocyanate groups of a urethane acrylate. As the reaction molar ratio of PEG to HEMA increased, droplet sizes and viscosity of PMUA emulsions decreased, however, the tensile strength and conversion of UV-cured PMUA film decreased. The molecular weight and type polyol had a significant influence on emulsion droplet size and stability. The coating properties and mechanical properties of the UV-cured film were improved by using crosslinking agent and epoxy acrylate. However, centrifugal stability was decreased by the addition of these additives.

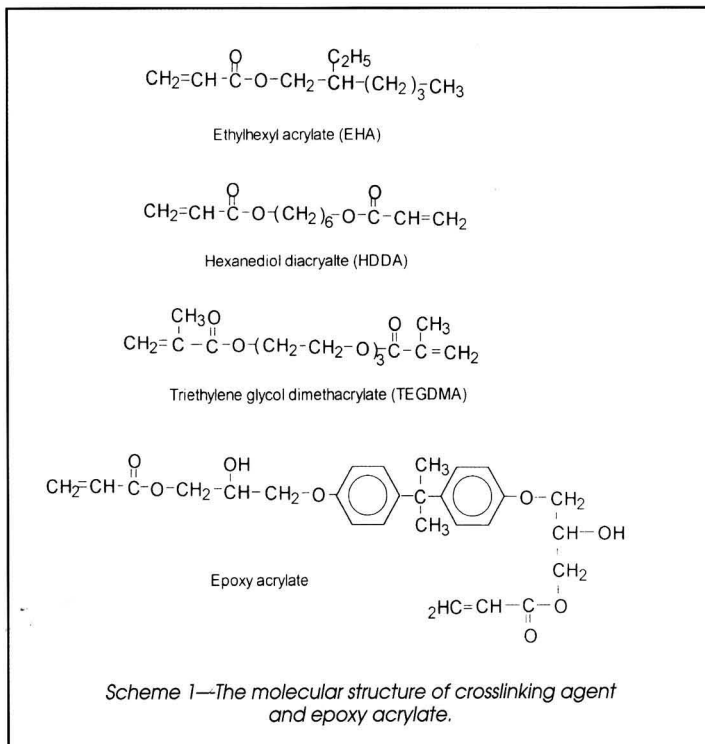
centrifugal stability, viscosity, coating properties, and mechanical properties of cured films were investigated. Additionally, to enhance the coating properties of PMUA, the change of mechanical properties with addition of crosslinking agents and epoxy acrylate was studied.

EXPERIMENTAL

Materials

In the synthesis of PMUA and UA, poly(tetramethylene glycol) (PTMG, Mw = 1000, 2000, Hyosung BASF), poly(propylene glycol) (PPG, Mw = 1000 and 3000, Korea Polyol), 2,4-toluene diisocyanate (TDI, Junsei Chemical Co.), 2-hydroxyethylmethacrylate (2-HEMA, Aldrich

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Chemical Co.) poly(ethylene glycol) (PEG, Mw = 600, Junsei Chemical Co.) were used. Tween™ 60, 20 and SPAN™ 20, 60 (Shinyo Pure Chemicals Co.) were employed in the preparation of UA emulsions.

Ethylhexyl acrylate (2-EHA), 1,6-hexanediol diacrylate (HDDA), and triethylene glycol dimethacrylate (TEGDMA) were used as crosslinking agents (CA), to improve physical properties rather than to reduce the viscosity of formulation. All of these chemicals were purchased from Aldrich Chemical Co.

To give formulation hardness characteristics, epoxy acrylate was blended with urethane acrylate. Epoxy acrylate (EA) was synthesized by reaction of epoxy resin (Kuk-Do Chemical Co., bisphenol A type, 11,500-13,500 cps. at 25°C) with acrylic acid (Junsei Chemical Co.). CA and epoxy acrylate(EA) structures are shown in Scheme 1. (1-Hydroxycyclohexyl)-phenylmethanone (Ciba-Geigy Chemical Co., Irgacure 184) was used as a photoinitiator and tert-butyl benzoate (Junsei Co.) was used as a thermal initiator for post-curing.

Synthesis of PMUA and UA

The UA and PMUA were synthesized by two- or three-step processes. The molar ratio of reactants was summarized in Table 1. These reactions were carried out in a four-neck glass reactor equipped with stirrer, thermometer, reflux condenser, and inlet system for N₂ gas.

In the first step, TDI was poured into a nitrogen inerted four-neck glass reactor. Then PTMG was added dropwise while mixing at 45°C. Then the reaction temperature was raised to 55°C so that the isocyanate group of TDI reacted with the hydroxy group of PTMG. This temperature was maintained for seven hours to sustain an acceptable reaction rate. The disappearance of the NCO value during the reaction was determined using the dibutyl-amine back titration method to find the reaction end point.⁷

In the second step, 2-HEMA was slowly added to react with residual isocyanate groups at 45°C for four hours. This introduced reactive acrylate groups onto the chain end. The reaction temperature was then increased to 75°C to eliminate unreacted isocyanates. For PMUA, the reaction end point for this step was attained when the NCO value was constant with time. However, for UA, the reaction end point was determined by the disappearance of 2270 cm⁻¹ infrared band which

corresponds to NCO stretching.

UA was prepared by a two-step reaction, however, PMUA was synthesized by three consecutive reaction processes. The first and second steps were the same process as the synthesis process of UA. In the third step, PEG was poured into the kettle to react with the last residual isocyanate. This process made it possible to introduce polyoxyethylene groups onto the molecular chain ends. Thus, both hydrophilic groups and reactive acrylate groups existed on one molecule. The reaction end point of this step was determined by the disappearance of 2270⁻¹ infrared band.

Table 1—The Synthesis Composition of PMUA and UA

Symbols	Reagents	Stoichiometry
UA ^a	PTMG 1000/TDI/2-HEMA	1/2/2
PMUA1	PTMG 1000/TDI/2-HEMA/PEG600	1/2/1.85/0.15
PMUA2	PTMG 1000/TDI/2-HEMA/PEG600	1/2/1.70/0.30
PMUA3	PTMG 1000/TDI/2-HEMA/PEG600	1/2/1.50/0.50
PMUA4	PTMG 1000/TDI/2-HEMA/PEG600	1/2/1.20/0.80
PMUA5	PTMG 2000/TDI/2-HEMA/PEG600	1/2/1.70/0.30
PMUA6	PTMG 2000/TDI/2-HEMA/PEG600	1/2/1.20/0.80
PMUA7	PPG 1000/TDI/2-HEMA/PEG600	1/2/1.85/0.15
PMUA8	PPG 1000/TDI/2-HEMA/PEG600	1/2/1.70/0.30
PMUA9	PPG 1000/TDI/2-HEMA/PEG600	1/2/1.50/0.50
PMUA10	PPG 1000/TDI/2-HEMA/PEG600	1/2/1.20/0.80
PMUA11	PPG 2000/TDI/2-HEMA/PEG600	1/2/1.50/0.50
PMUA12	PPG 1000, triol/TDI/2-HEMA/PEG600	1/2/2.0/1.0
PMUA13	PPG 3000, triol/TDI/2-HEMA/PEG600	1/2/2.0/1.0

(a) UA: unmodified urethane acrylate.

The average molecular weight of PMUA and confirmation of these reactions through ^1H NMR and GPC were reported in our previous papers.⁸⁻⁹ Scheme 2 shows the molecular structure of PMUA (the mixture of (A) and (B) type molecules) and UA ((A) type molecule).

Preparation of UV-Curable Formulations

An oil solution (10 g) containing additives was placed in a 100ml beaker and heated to 45°C to melt, then cooled to 35°C while vigorously stirring. Distilled deionized (DDI) water initially was added very slowly until a gel formed, then the last remaining water was added gradually to reduce viscosity. The formulation used in the preparation of UV curable emulsions is summarized in Tables 2 and 3.

Measurement

Emulsion droplet size was measured with an Ostuka electronic laser particle analyzer, LPA-3000/3100 (droplet size < 1 μm) and Elzone 620 PC (droplet size > 1 μm).

The centrifugal stability of the urethane acrylate emulsions was determined by the ratio of weight of precipitated oil to that of extracted emulsion sample, after centrifugation at 15,000 rpm for 10 min. The centrifugal stability of the emulsion was represented by the following equation.¹⁰⁻¹³

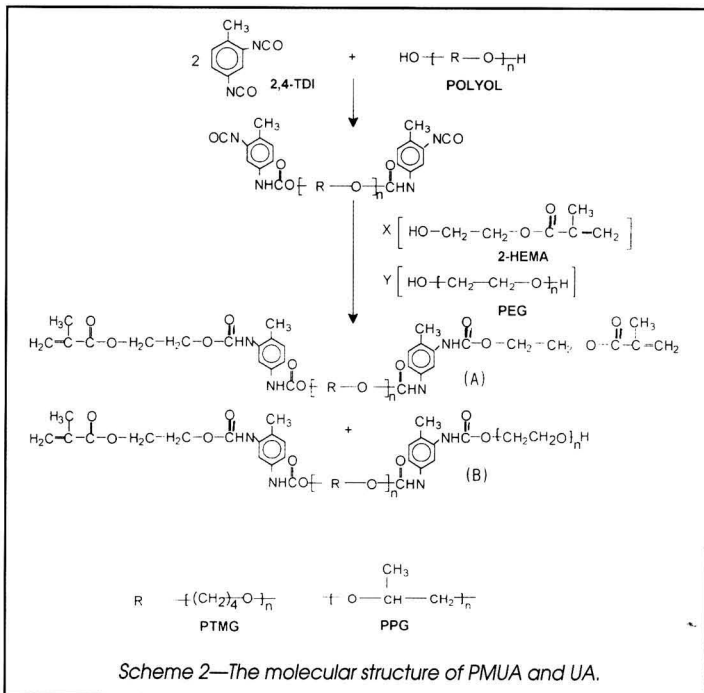
$$\text{Oil separation percent (\%)} = \frac{W_o}{W_s} \times 100 \quad (1)$$

W_o = the weight of precipitated oil (g)
 W_s = the weight of emulsion sample (g)

The viscosity of PMUA emulsions was measured using a Brookfield Rheoset. Shear rate was raised by sec^{-1} at intervals of 20 sec. Mechanical properties were measured with Hounsfield model Instron at room temperature using a crosshead speed of 5 mm/min and load cell capacity of 50 kgf. All measurements, using samples cut from cured films,¹⁴ respect the average of three runs. The engineering stress was calculated based on the initial area of the sample.

Characterization of Coating Properties

The formulations were drawn down on PVC plate and glass plate and then water was evaporated at 60°C in vacuo. These formulations were cured in air using a static UV lamp (450 watt UV lamp from Ace Glass Co.) for five minutes as the radiation source postcuring at 60°C for two hours at reduced pressure.



Coatings with thickness of about 0.5 mm were used for pencil hardness measurements and for crosshatch adhesion.¹⁵⁻¹⁶ Stain resistance was determined by applying an oil ink to a cured film and determining whether the stain was permanent or if it can be removed by cleaning.¹⁷ Flexibility was measured by bending coated PVC panels 180° around standard cylinders with 1, 3/4, 1/2, 3/8, 1/4, and 1/8 in. diameters and observing cracking on the surface of coating where films were coated with thickness of about 60 μm .¹⁸

Conversion (gel fraction) was determined by peeling cured films from the substrate and weighing the dried film. Each film was then placed in a scintillation vial and extracted with 2-butanone for 30 min on a wrist-action shaker. Films were removed intact from the solvent and dried to constant weight at 60°C in vacuo, then reweighed.¹⁹ The conversion was calculated from:

$$\text{Conversion (\%)} = \frac{W_f}{W_c} \times 100 \quad (2)$$

Table 2—Formulation for Preparation of UV Curable UA Emulsions

UA	10 g
DDI water	50 g
PI	0.3 g
TI	0.2 g
CA	0-1 g
Surfactants	3 g
Span 20	0.4285-1.856g
Span 60	0.2650-1.147g
Tween 20	0.3306-1.424 g
Tween 60	1.147-2.734 g

PI: photoinitiator, Irgacure™ 184; TI: thermal initiator, tert-butyl benzoate; CA: crosslinking agent which was the mixture of 2-EHA, HDDA, and TEGDMA with the mixing ratio of 1:1:1; EA: epoxy acrylate.

Table 3—Formulations for Preparation of UV-Curable PMUA Emulsions

PMUA (g)	10	10	10	10	10	10	10	10	10
CA (g)	—	0.3	0.5	0.7	1.0	—	—	—	—
EA (g)	—	—	—	—	—	0.2	0.3	0.4	0.5
DDI water (g)	21	21.6	22	22.4	23	21.6	22	22.4	23
PI (g)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TI (g)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

PI: photoinitiator, Irgacure™ 184; TI: thermal initiator, tert-butyl benzoate; CA: crosslinking agent which was the mixture of 2-EHA, HDDA, and TEGDMA with the mixing ratio of 1:1:1; EA: epoxy acrylate.

Table 4—Centrifugal Stability and Droplet Size of PMUA Emulsions and Tensile Strength of Their Cured Films

	PMUA3	PMUA9	PMUA11	PMUA12	PMUA13
Tensile strength (Kg/cm ²)	8.883	7.157	5.7	15.693	7.12
Oil separated %	0 ^a	2.687	— ^b	30.609	— ^b
Droplet size (nm)	54.11	94.27	— ^b	327.3	— ^b

(a) Means that emulsion was not broken by centrifugation.
 (b) Means that emulsion could be formed.

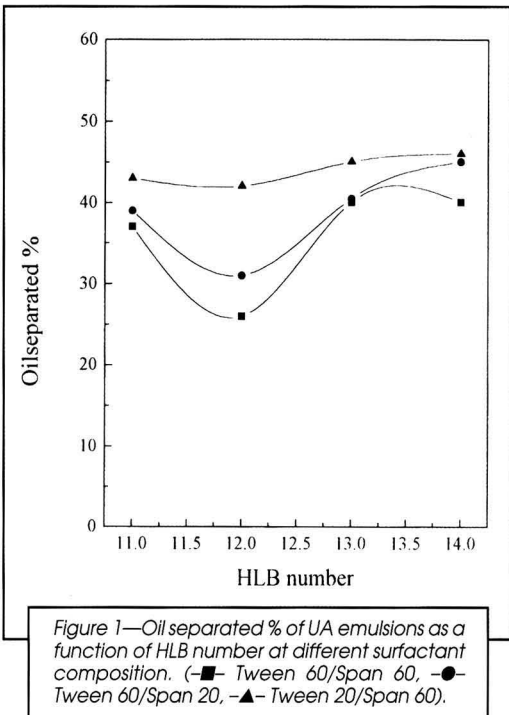
$$W_f = \text{the weight of sample after curing (g)}$$

$$W_c = \text{the weight of sample before curing (g)}$$

RESULTS AND DISCUSSION

UA Emulsions Prepared Using Mixed Surfactants

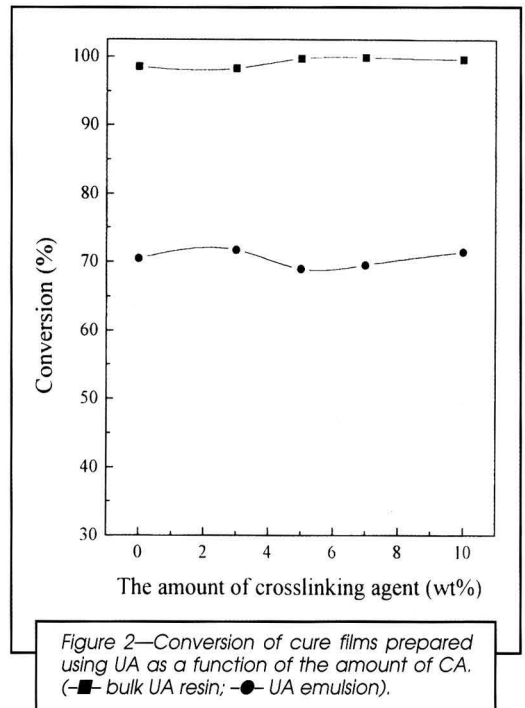
Figure 1 shows the centrifugal stability of oil/water emulsions of UA without hydrophilic groups on the molecular backbone. The order of centrifugal stability was Tween 60-Span 60 > Tween 60-Span 20 > Tween 20-Span 60.



Therefore, the most relatively stable emulsion was formed at HLB 12 with TweenN 60-Span 60.

The conversion and the tensile strength of cured films prepared using bulk resin and emulsions of UA are illustrated in Figures 2 and 3, respectively.

When the properties of cured film as a bulk resin were compared with those of films prepared using UA emulsions, the emulsion type films showed lower tensile strength and conversion than bulk cured films. Additionally, properties of those resins did not improve even though the amount of crosslinking agent increased.



These results were due to the fact that surfactant was arranged in the water/oil interface and exerted a blocking effect on UV radiation and interfered with crosslinking.

Soap-Free Emulsion of PMUA

To prepare soap-free emulsions and exclude the deleterious effect of surfactant, PMUA were emulsified without external surfactants. The results of emulsion droplet size measurements are illustrated in Figure 4. The droplet sizes of both types of PMUA (PTMG and PPG Type PMUA) emulsions decreased as the reaction molar ratio of PEG increased. These results indicated that urethane acrylate molecules containing polyoxyethylene groups act as a polymeric surfactant and the number of these groups increase with the increase of PEG reaction molar ratio, so finer droplet emulsions could be formed.

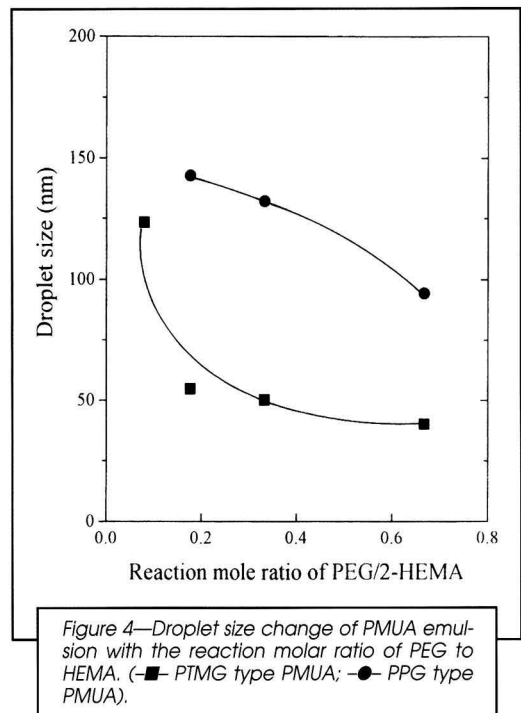
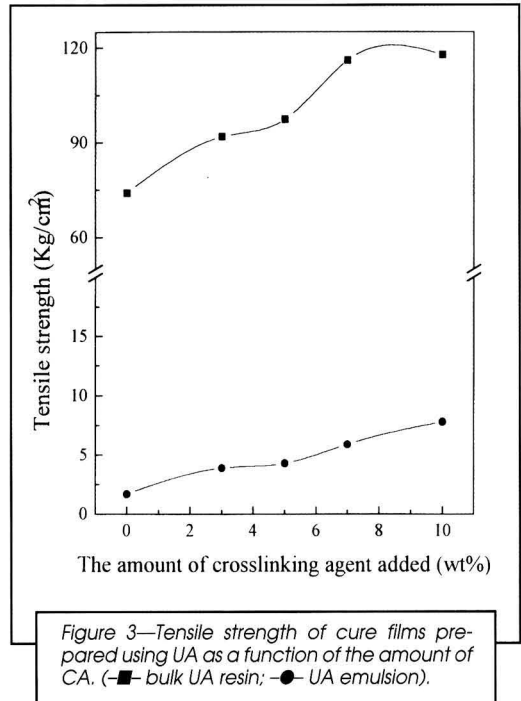
In our previous experiments, the interfacial activity of PMUA molecules was confirmed by the adsorption behavior at water/benzene interface. As the reaction molar ratio of PEG to HEMA increased, the number of molecules acting as a polymeric surfactant increased so that interfacial tension of water/benzene decreased. In other words, the PMUA having the smallest emulsion droplet size showed the lowest interfacial tension.⁸⁻⁹

It is important to measure the viscosity of emulsions with a certain solids content, because in the case of emulsion type UV-curable resins, water must be evaporated in formulation before UV radiation. Thus, a higher solids content at the same viscosity is beneficial in terms of energy efficiency. Figure 5 shows the viscosity change of PMUA emulsions as a function of water content. At a constant solid content, the viscosity of PMUA emulsions decreased with the increase in the reaction molar ratio of PEG. It was thought that finer emulsion particles were formed with an increase in the reaction molar ratio of PEG owing to the decrease of the interaction between particles.

Figure 6 shows the tensile strength and conversion change of cured films with the reaction molar ratio of PEG. Tensile strength decreased with the increase in the reaction molar ratio of PEG. These results were due to reduction of the number of acrylate groups that participated in curing. Figure 7 illustrates the conversion change of PMUA with reaction molar ratio of PEG. As expected, the conversion of cured films decreased with the increase of reaction molar ratio of PEG.

To investigate the deleterious effect of surfactants, the tensile strength of UV cured films prepared using UA emulsions containing a large amount of surfactants were compared with that of films prepared using soap-free PMUA emulsions. Tensile strengths of both film types are illustrated in Figure 8. The UV cured films of PMUA, containing less crosslinked network, show higher tensile strength than the films prepared from UA emulsions.

Table 4 shows the centrifugal stability and droplet sizes for four types of PMUA emulsions, and tensile strength of their UV-cured films. PMUA3 prepared using PTMG 1000 showed smaller droplet size and higher tensile strength than PMUA9 prepared using PPG 1000.



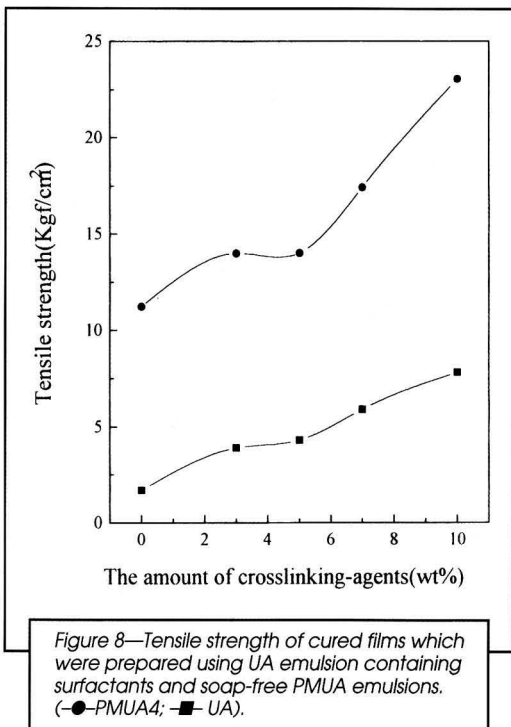
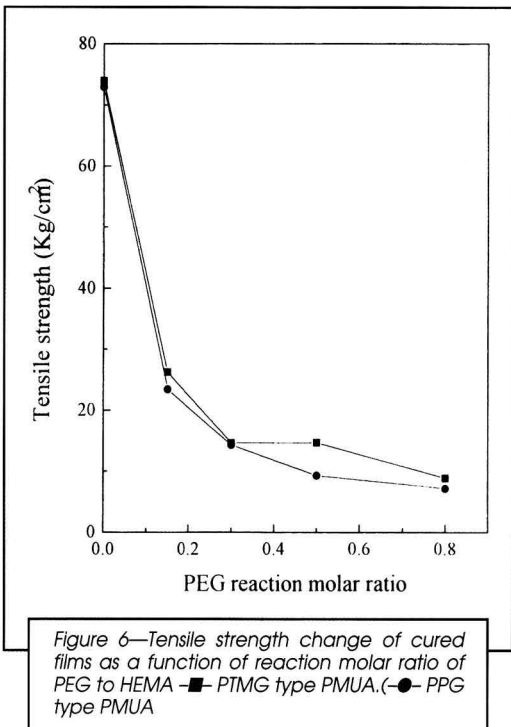
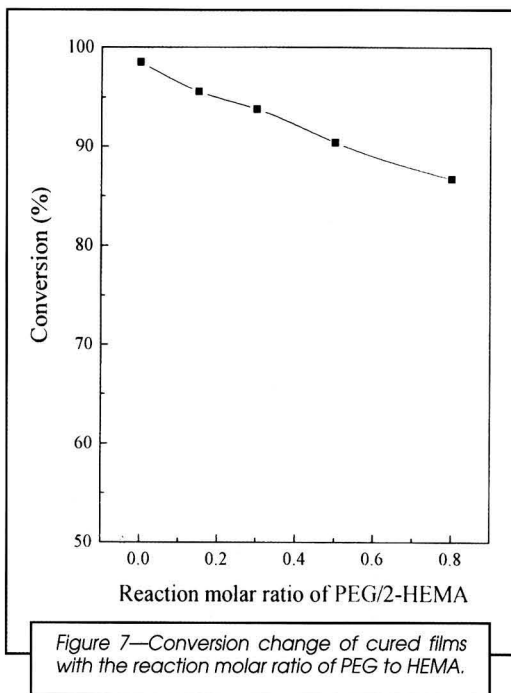
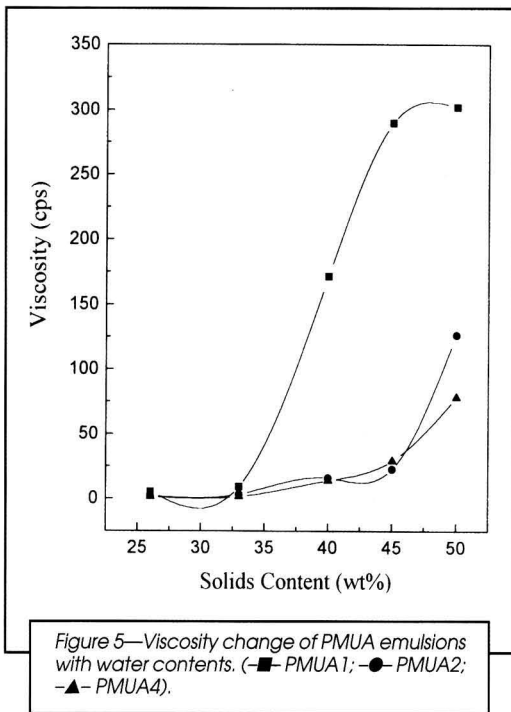


Table 5—Coating Properties of PMUA at Different Added Amount of CA and EA

CA (wt %)	0	3	5	7	10
Pencil hardness	6H	6H	6H	6H	6H
Stain resistance	Good	Good	Good	Good	Good
Adhesion (/100)	83	95	98	98	98
Flexibility (in.)	0	0	0	0	1/8
EA (wt%)	0	3	5	7	10
Pencil hardness	6H	6H	6H	6H	6H
Stain resistance	Good	Good	Good	Good	Good
Adhesion (/100)	83	80	80	78	78
Flexibility (in.)	0	0	0	0	0

UV-cured film of PMUA12 had higher tensile strength than PMUA9 and PMUA13. However, centrifugal stability and droplet size of those emulsions showed opposite order.

The Effect of Crosslinking Agent (CA) and Epoxy Acrylate (EA)

The centrifugal stability change of PMUA emulsions and tensile strength change of those films with the amount of CA and EA were shown in Figures 9-a and b, respectively. Droplet sizes of these emulsions were about 55-70 nm. As the amount of added CA and epoxy acrylate increased, the centrifugal stability of emulsions reduced, however, tensile strength of cured films improved. The conversion change with the weight percent of CA and EA added is presented in Figure 10.

As the weight percent of CA and EA increased, the conversion of cured films increased, because crosslinking density of cured films increased owing to the reaction of pendant double bond of multifunctional monomer, and the plasticization effect of unreacted monomer was diminished.

Coating property changes with the amount of CA and EA added are given in Table 5. As the weight percent of added CA and EA increased, pencil hardness showed constant good results (6H) owing to the increase in crosslinking density of cured film.²⁰ Adhesion was measured using crosshatch adhesion method. As the weight percent of added CA increased, the cured film showed good adhesion. These results were due to formation of grafting bond between PVC substrate and acrylate group of the multifunctional acrylates which were initiated by photoinitiator.²¹ As the weight percent of added EA in-

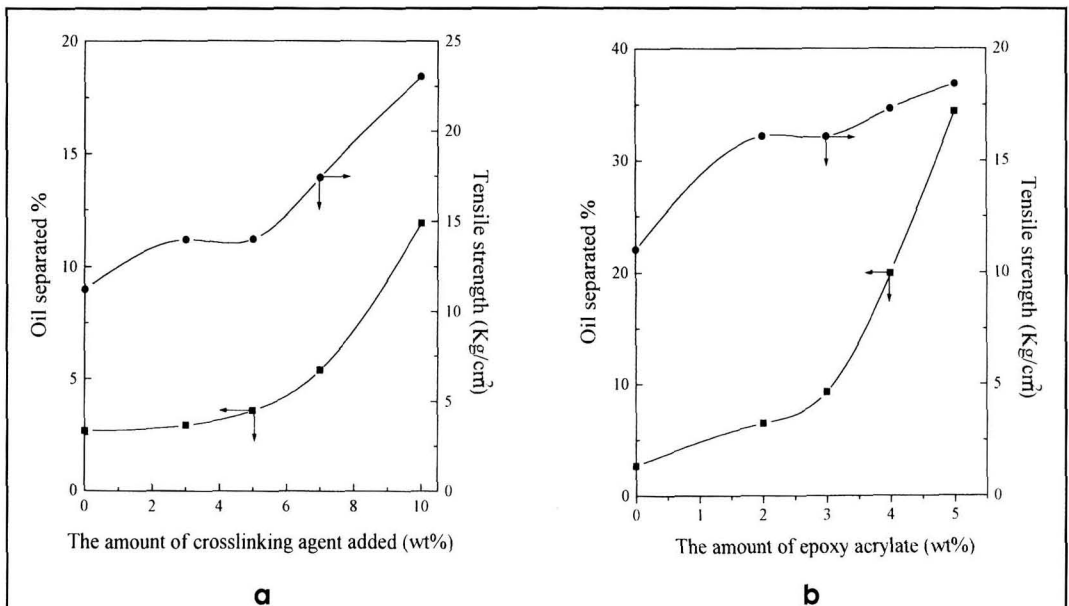
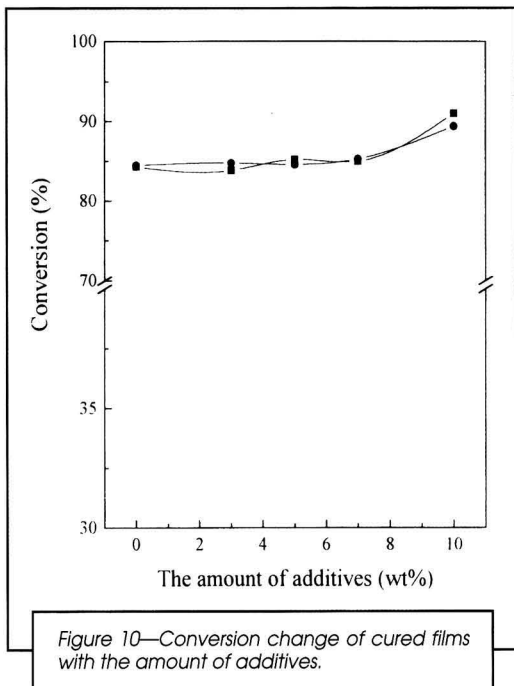


Figure 9—(a) Oil separated % of emulsion and tensile strength of its cured film as a function of the amount of crosslinking agent: —■— oil separated %; —●— tensile strength of cured film. (b) Oil separated % of emulsion and tensile strength of its cured film as a function of the amount of epoxy acrylate: —■— oil separated %; —●— tensile strength of cured film.



creased, the film adhesion also was good which was attributed to the addition of epoxy acrylate, a compound that has good adhesive properties, to the highly crosslinked network structure, and to excellent thermal stability.²²⁻²³ The UV-cured films of PMUA were very flexible and it could be maintained as the amount of CA and EA increased. Cracks did not appear as the concentration of CA and EA was increased. However, in the case of 10% CA, very small cracks were found.

CONCLUSION

PMUA, containing polyoxyethylene groups as terminal groups, were synthesized by the reaction of PEG with the residual isocyanate groups of UA, which could be soap-free emulsified, so the deleterious effect of surfactants would be absent. Droplet sizes and viscosity of PMUA emulsions could be controlled by the reaction mole ratio of PEG to 2-HEMA.

PMUA12 prepared using PPG triol 1000 showed higher tensile strength than PMUA3 and PMUA9, however, the emulsion of PMUA12 represented larger droplet size and lower centrifugal stability than these PMUA emulsions.

The tensile strength and conversion of the UV cured films were decreased with the increase of PEG reaction mole ratio, however, these properties could be improved by using crosslinking agent and epoxy acrylate, which made emulsion centrifugal stability slightly decreased. Additionally, according to results of pencil hardness

and flexibility measurements, cured films prepared using our formulations had a hard surface (6H) and were very flexible.

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June 1996 Subcommittee Reports of ASTM Committee D-1

The June meeting of Committee D-1 was held June 23-26 at the San Francisco Hilton and Towers, San Francisco, CA. There were 226 D-1 members and guests meeting in about 190 scheduled working task group and subcommittee meetings. The current D-1 membership is 622.

Highlights

This was the first time Committee D-1 and ISO/TC 35 Paint and varnishes of the International Organization for Standardization (ISO) met concurrently. ISO/TC 35 met in Philadelphia's ASTM Headquarters in 1977, but separate from Committee D-1. This "joint" meeting allowed ISO and ASTM members to attend meetings of their counter parts with no restrictions. Many ASTM and ISO working group members took advantage of the opportunity which resulted in members getting to know more about each other's test methods on materials, paints and coatings. ASTM members now are more familiar with ISO test methods. Likewise, ISO members now are more familiar with ASTM test methods.

D01.94 held a reception to welcome the ISO delegates. M. E. McKnight, D-1 Chair, greeted the members of ISO who came to San Francisco to meet with D-1 and expressed our common goals for this joint meeting of the two organizations. E.L.J. Bancken, representing ISO, thanked D-1 for their hospitality and expressed hope for future joint meetings. Resolutions to acknowledge the passing of D-1 members were read for Joseph J. Bennett, James Ignatow and Paul N. Gardner, Sr. The following awards were handed out: D-1 Honorary Member, Clifford K. Schoff; Subcommittee Chair, Gary W. Gardner, Subcommittee D01.46; and Task Group Chair, Mary E. Sites, Task Group D01.21.56. Certificates of Appreciation were presented to Andrew F. Rutkiewicz, Benjamin P. Gavett, Richard J. Tucker, and John W. Daugherty.

D01.21.15—EPA/ASTM Liaison, a new task group formed at the last meeting, met to foster a working relationship between the U.S. EPA and D-1. This interaction will effectively expedite the acceptance of improved and new environmental test methods for coatings developed by D01.21, and allow ASTM to actively assist the EPA in meeting regulatory objectives.

At the D01.23.14 meeting, it was stated the two manufacturers of the Sward-Type Hardness Rocker used in D 2134, "Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Hardness Rocker," have dimensional specification differences, primarily with the component rings of their instruments. The manufacturers will provide detailed dimensional specifications of their instruments. These specifications will be included in the method as Sward-Type Hardness Rocker "A" and Sward-Type Hardness Rocker "B," so that the users of the method can report the instrument used and understand that the instruments do not provide comparable results.

At the meeting of D01.31.10, ISO Pigment Coordination, Chair R. Schiller introduced ISO/SC 2 Chair Manfred Wehner who explained the standard work load, and voting procedure handled by the seven working groups. The D01.31 voting procedures were defined for the benefit of guests. A concordance of the test methods and specifications between the two organizations was discussed and distributed to those in attendance.

At the D01.33 meeting, it was reported that the Emulsion Polymers Council asked D01.33 to develop standards for measuring VOCs, volatile organic concentrations, where the high content of water tends to obscure the quantitation of the small percentages of diverse organic coalesces, surfactants and other small additives and subject to the surveillance of EPA Method 24. The Emulsion Polymers Council was formed in 1996. It comprises environmental managers and associated analytical chemists employed by nine major producers of latexes which are media for very large volume production of paints. Their analytical chemists will be welcomed into D01.33.

At the meeting of D01.42.32, Whole Paint Specifications, most of the attendees stated that they were either neutral or opposed to the creation of whole paint specifications. Opposition was particularly significant among the producers present. The task group chair reminded meeting attendees of the results of the D01.42 member survey that signaled an interest in developing a specification for an interior flat latex paint. Attendees dis-

cussed the pros and cons of whole paint specifications for architectural finishes alternatives, such as a guide to specifying, were proposed and discussed. Opposition to developing specifications was significant. A guide to specifying was not determined to be beneficial.

At the meeting of D01.46.02, Surface Preparation, it was reported that ISO/TC 35/SC 12 will recommend D 4417 "Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel" Method C tape test as a new request item at their October 1996 meeting.

A. F. Rutkiewicz presented three photographs representing rust grades 5, 6 and 7 at the meeting of D01.46.03 for consideration as pictorial standards for D 610 "Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces." These photographs were made starting from a panel that experts agreed was a rust grade of 6. A computer enhancement was used to generate photographs of rust grades 5 and 7. These rust grades look like actual, real world rusting and they do agree with the % of rusted area indicated by the various rust grades (5 = 3%, 6 = 1%, and 7 = 0.3%). Computer enhanced photographs will be used for the remaining rust grades of 1, 2, 3, 4, 8, and 9.

At the meeting of D01.51.07, ISO/TC 35/SC 9/WG 16 Convener R. Chambers suggested a triangular wedge for determining uncured powder thickness. It will be reviewed with Paul N. Gardner Co. before the January 1997 meeting.

During the meeting of D01.52.15, Film Thickness, G. Hora (ISO/TC 35) described difficulty in calibration of the ultrasonic film thickness instrument on wood in Europe. Expansion of D 5235-92 to include video image microscopes as well as optical instruments was also discussed. A ballot for reapproval with a reference to the existence of video microscopes was recommended.

Dates and Locations of Future Meetings

January 26-29, 1997 - Ft. Lauderdale, FL
 June 22-25, 1997 - Toronto, Canada
 January 11-14, 1998 - San Diego, CA
 June 6-10, 1998 - Baltimore, MD
 January 24-29, 1999 - Memphis, TN
 June 12-16, 1999 - Cincinnati, OH
 January 23-28, 2000 - New Orleans, LA

DIVISION 1 ADMINISTRATION

Subcommittee D01.05 ASTM Internal Coordination J. C. Weaver, Chair

The six attendees recognized the complex difficulty of vigilant technical coordination, not only across D-1's 30 technical subcommittees, but across the 2,000 subcommittees of the other 131 technical committees. Commonality of membership between a D-1 task group and a relevant subcommittee among those 2,000 is the easy, efficient mode of surveillance.

D-1 Bylaw 5.10 on Coordination requires that each D-1 technical subcommittee establish a permanent, numbered, named task group to coordinate with each relevant subcommittee throughout ASTM. D-1 subcommittee chairs are urged to implement one or several of these and to report these actions diligently in their regular subcommittee reports. Obvious examples include D01.21/E-15, D01.26/E-12, D01.27/G-3, D01.33/D-20, D01.35/D-2 and D-16, D01.46/D-33, and others.

D-1 chair M. E. McKnight asks that the foregoing be distributed with an early regular mailing to D01.90 members and subcommittee chairs.

Subcommittee D01.06 International Coordination J. C. Weaver, Chair

A new high in international cooperation on paint standards was reached when, for the first time ever, about 50 representatives of ISO/TC35 on Paints and Varnishes met concurrently with Committee D-1. Representatives from Europe, Israel, South Africa, China and Japan mingled with their U.S. hosts in an evening social reception as well as in numerous D-1 Task Group and Subcommittee meetings. Some of these are reported by D-1 Subcommittee 9 coordinating with ISO/TC35/SC 9 on Paint Properties and in Task Group D01.31.13 Groups with corresponding Task Groups spread across the gamut of D-1's technical subcommittees.

D01.31.13 Task Group Chair R.M. Schiller has created a detailed concordance between 84 items of ISO/TC35/SC2 on Pigments and the relevant standards and task groups in Subcommittee D01.31 on Pigments, D01.26 on Optical Properties, et al. TC35/SC2's Chair Manfred Wehner and Secretary Weinmueller of DIN, Germany will coordinate through R.M. Schiller toward mutual memberships in relevant working/task groups in TC35 and D-1.

Eleven members and guests of D0.106 overviewed formally this first joint meeting of D-1 and ISO/TC35, welcoming especially Dr. Stache Bancken, Chair from 1984 of ISO/TC35. Informally the mutual attendance and personal acquaintances should enhance cooperation in initial drafts and redrafts of individual standards in both bodies. Correspondence in large volume subsequent to the June meeting indicated high interests in numerous coordinations.

A comprehensive concordance and cross index between TC35's approximated 250 standards and D-1's approximate 680 standards is a large challenge to D-1 leaders and members. Volunteers on this will be welcome.

Subcommittee D01.08 Environmental Concerns E. A. Praschan, Chair

D01.08 Chair summarized current environmental-related method developments and other activities of interest within D-1. D01.21 has many activities in process on improvements and developments pertaining to VOCs, HAPs, etc. D01.24 is updating D 5201, "Practice for Calculating Formulation Physical Constants of Paints and Coatings." D01.55 has issued several methods involving measurements of transfer efficiency.

M.E. McKnight advised that E-50 on Environmental Assessment is working on a guide for designating "Green Buildings." Other projects address environmental audits standards and lead hazards.

W.C. Golton states that VOC Training Workshops continue to be successful and generate interest. The next workshops are scheduled for November 6-7, 1996 at the South Coast Air Quality Management District offices and on May 1-2, 1997 at the Chicago Sherwin-Williams laboratory.

J.J. Brezinski has agreed to be the editor of the next update of ASTM manual MNL 4 on *Determination of VOC in Paints*. He provided a draft outline of the work planned and invited input.

The Chair reviewed highlights of current EPA regulatory activity on clean air matters. Tighter air quality standards are expected to be proposed later this year for both ozone and particulates. The rule for VOC control for Architectural and Industrial Maintenance coatings was signed on June 18, 1996. MACT standards have recently been issued for printing and publishing aerospace and shipbuilding. The proposed open market trading rule requires rigorous test methods to verify emissions for trading purposes. A rule will be proposed later this year which will require new procedures for monitoring emissions-related equip-

ment and processes to provide agencies with greater assurance of ongoing compliance.

The Chair advised that U.S. EPA is ready to meet with D-1 representatives to discuss plans and strategy for ongoing methods development that would further EPA's environmental objectives. This interest is at least partly due to the recently signed legislation (HR 2196) requiring government agencies to utilize standards developed by voluntary consensus organizations. A joint meeting will be scheduled as soon as possible that is expected to produce a framework for increased communication and cooperation between D-1 and EPA on test method development needs. Selected working group activities are expected to follow.

Subcommittee D01.09 Technical Advisory Group to ISO/TC 35/SC 9 M. E. McKnight, Chair

T. J. Sliva, Secretary of D01.09, reviewed the status of the compilation of the equivalency test method list for ISO TC 35/SC 9 and D-1. Eight of the 10 members involved in compiling the list have completed their work. A commitment to complete the remaining work by September 1 was requested.

A report was made on the various ballot actions taken on ISO/TC 35/SC 9 methods since the January 1996 meeting, as well as current working items to be discussed in ISO/TC 35/SC 9 meeting being held in conjunction with the D-1 meeting and, where applicable, balloted upon before the next meeting.

T. J. Sliva reported that the proposed scope for D01.09 was accepted as written at the January 1996 D01.90 meeting.

J. Weaver, Vice Chair of D01.09, reviewed the progress made on setting up a technical advisory group for SC 2 on pigments, with R. M. Schiller acting as the Chair on the work being conducted under task group D01.31.13. D-1 is looking to get involved in SC 1 on terminology and SC 10 on test methods for binders in paints and varnishes.

Subcommittee D01.94 Awards and Memorials T. J. Sliva, Chair

D01.94 met in conjunction with the reception being held for the ISO delegates in attendance. M. E. McKnight, D-1 Chair, opened the meeting by greeting the members of ISO who have come to San Francisco to meet with D-1 and expressing our common goals for this joint meeting of the two organizations. E.L.J. Bancken, representing ISO, expressed his thanks to D-1 for their hos-

pitality and hopes for future joint meetings. T. J. Sliva read resolutions prepared by D-1 to honor the passing of D-1 members Joseph J. Bennett, James Ignatow and Paul N. Gardner, Sr. J. C. Weaver, D-1 Honorary Chair, discussed the decades of contributions Paul N. Gardner, Sr. made to the paint industry and his continuous outstanding support for D-1, including monetary contributions to develop and sustain the Task Group Chair and Euverard Innovation Awards.

The chair presented the following awards: D-1 Honorary Member, Clifford K. Schoff; Subcommittee Chair, Gary W. Gardner, Subcommittee D01.46; and Task Group Chair, Mary E. Sites, Task Group D01.21.56. Certificates of Appreciation were presented to Andrew F. Rutkiewicz, Benjamin P. Gavett, Richard J. Tucker, and John W. Daugherty.

Subcommittee D01.96 Long Range Planning G. R. Pilcher, Chair

The solicitation letter seeking a \$20.00 donation ("activity fees"), mailed in October 1995, to support D-1 activities, produced nearly \$600 in additional revenue. The letter will be repeated this autumn. In addition, single page registration desk hand-outs, in "bullet point" style, headed "Your Activity Fee at Work," will be prepared for each meeting. D01.96 feels that an industry survey—addressing the perception of what ASTM is, does, and should do—would be a meaningful way to assess the need for certain types of long-range planning. S. Orthey has agreed to discuss the mechanics of such a survey with ASTM marketing personnel. He will also discuss the feasibility of creating a Focus Group within D-1 membership to assess "how we are doing." D01.96 also wants to target certain industry forums (journals? technical meeting presentations? other?) for articles/guest editorials on behalf of both D-1 and ISO TC 35 to bring a greater appreciation for the need for standards and D-1's and TC 35's roles in providing them.

DIVISION 20 RESEARCH

Subcommittee D01.21 Analysis of Paints and Paint Materials K. H. Fujimoto, Chair

D01.21.10—*Lead Paint Policies*—J.C. Weaver, Chair, discussed lead hazard coordinations within and outside of ASTM. The groups of coordination include: ASTM E06.12 on Lead Abatement

in Structures, ASTM E51.04 on Loss Control (of Lead in Rental Housing), ASTM D01.57.08 continues on gastric solubility in art materials, ISO/TC 35/SC 2/WG 10 which parallels D01.57 studies, Lead Tech '96 which meets in October in Washington, DC to hear 125 speakers, and NPCA's Community Lead Education and Reduction Corps (CLEARCorps) which is sponsoring lead abatement in three cities.

ASTM *Standardization News*, May 1996, page 12, reports E51.04 on Loss Control has developed PS61 Draft Provisional Standard Guide for Prevention and Control of Lead-Based Paint Hazards in Rental Housing. This perpetuates "lead-based paint" as technically false but a politically correct term.

While the base of any paint is never the pigment and always the media, e.g. linseed oil, latex or other binder of pigments, this term deserves quantitation for legal and political uses. Lead in or on solid paint at 600 ppm as adopted ca 1973 by CPSC, while remaining at 5,000 ppm in other regulatory agencies as a working definition of "lead-based paint," faces incisive challenges in both identity and quantitation. James Sayre's 1970's dramatic demonstration to HUD of easy washing of leaded surface dust in homes was largely ignored. Now, lead in dust, dirt, and soil gets increased attention, though with scant attribution to lead fall-out from gasoline as the principal source.

U.S. Congressional law that any pre-1978 paint contains lead ignores the mid-1900's diversity of lead pigment use from high lead in industrial paints on structural steel to no lead in most paints for home interiors simply because of lower cost opacity with lithophone and titanium dioxide pigments replacing white lead pigment. Quantitation of lead in "lead-based paints" is evolving well in E06.23 Subcommittee on Lead Abatement in Structures. About 28 standards in various stages from draft to full adoption may emerge as a special compilation in late 1996, as well as, in Volume 04.07. Five of the 28 are in a July 1996 E06.23 ballot has 75 page drafts, including: (1) a Guide in 35 pages which might overwhelm E51.04's PS61, (2) practice for XRF *in situ* measurement of lead with constraints and caveats, (3) practice for ultrasonic extraction, and (4) practice for lead by field-portable electroanalysis.

D01.21.13—*Coordination of VOC Standards and Information*—M. K. Harding and R. C. Matejka, Co-Chair, stated the EPA will be publishing a clarification of the hazardous air pollutant reporting requirements for wood furniture coatings in September, i.e., while carcinogens must be reported down to 0.1%, other hazardous materials can be reported at the 1.0% level.

The status of the rules limiting the VOC content of architectural coatings were summarized. The national rule has been proposed on the EPA Bulletin Board, and it is to be published in the Federal Register on June 25 or 26, 1996. If needed, a hearing will be scheduled on July 30, 1996 and the comment period will be open for 60 days from the date of the publication.

Miscellaneous VOC items are: (1) Jefferson County, KY amended its VOC rule and provided a limited stock cleaning provision: all coatings sold after October 1996 must comply with the regulation regardless of the date of manufacture. (2) Three counties in Oregon and one county in Washington have a VOC rule effective July 1, 1996. (3) South Coast AQMD, the Los Angeles area, will be proposing significant reductions in the VOC content of flat coatings which are to be effective in the years 2002 and 2008; reduction in VOC of lacquers to 550 g/L; reduction in the VOC of traffic coatings to 150 g/L less water and/or exempt compounds.

EPA is behind on the issuance of maximum achievable control technology (MACT) rules for many source categories. In order to catch up and to provide states some indication of MACT guidance for the Title V permit program, EPA is advocating "adopt a MACT" or "share a MACT" for source categories for which no guidance exists. Once a similar MACT is identified, EPA will issue a p-MACT (presumptive MACT) for the source category. The p-MACT is issued with very little data collection or input by the interested parties. Eventually, EPA will get around to a formal MACT, but in all likelihood p-MACT will be the abbreviated form of the formal MACT.

EPA and its contractor, Alpha-Gamma Technologies, have concluded source categories with a variety of production processes, which includes paint and coating manufacture, should all be controlled by a common MACT, MON MACT [(miscellaneous organic (MO)) National Emission Standards for Hazardous Air Pollutants (NESHAP)]. The source category may be sub-divided by whether the production process is continuous, batch or formulation specific.

Paint and coating manufacture falls into the formulation specific process identification. The paint and coating MON MACT will be equipment based with no data collection, but a model plant cost will have to be done. Resin manufacturing will be a batch process. The p-MACT will be issued by the end of the year. The next meeting is on July 9, 1996 primarily to examine how the MON MACT fits continuous production processes.

The auto-refinish VOC regulation has been promulgated with its publication in the Federal Register. Of particular interest is the EPA discussion on the confidence limit adjustments to the VOC analysis on waterborne coatings.

The VOC regulation on consumer products, excluding aerosol products, was proposed in the Federal Register on April 2, 1996. The limits for aerosol deodorants and antiperspirants apply only to compounds with a vapor pressure greater than or equal to 80 mm @ 20°C. This is of interest to the coating manufacturers as a precedent setting approach to categorizing VOCs.

Some of the topics discussed by D01.21.13 were: (1) the California Air Resources Board (CARB) proposed Test Method 310 references ASTM test methods for VOC determination rather than using CARB developed test methods, and (2) in recent regulatory development, there is recognition of the importance of the presence of nitrogen oxides (NOx) in the formation of ozone instead of VOCs and a need to control them.

D01.21.14—New Publications and Workshop—J. J. Brezinski, Chair, took over as Chair of D01.21.14 from K. H. Fujimoto. The chair has agreed to become editor of the ASTM MNL 4, for the publication of the 3rd Edition of "Determination of Volatile Organic Compounds (VOCs) Content of Paints, Inks and Related Coating Products." Some planned additions and revisions are: (1) Focus on new Federal regulations including National Rules on the control of the emission of VOCs and Hazardous Air Pollutants (HAPs). (2) Associated Federal and ASTM Test Methods on the determination of VOC and HAP content. (3) Revision of key ASTM Standards used in VOC compliance demonstration and discussion of ongoing ASTM studies and new HAP and VOC related standards. (4) Publication of the third edition in the fall of 1998. (5) A summary review of the National Emission Standards-HAPs (MACT) or National Rules, Best Available Control Technology (BACT) and New Control Guidelines (CTG) which will be promulgated before 1998.

ASTM Standards approved or expected to be approved by the EPA by mid-1998: D 5403, Volatile Content of Radiation-Curable Materials; D 2697, Volume Nonvolatile Matter, including the revision using the helium pycnometer; D 2369, Volatile Content of Coatings, technical revisions; Oven VOCs Available for Abatement (under development); D 5200, Volatile Content of Solvent-Based Aerosol Paints; D 5325, Volatile Content of Waterborne Aerosol Paints; D 3960, Calculations of VOCs; D 4017, Water Content in Paints by Karl

Fischer Method; and D 1475, Paint Density. The ASTM Paint VOC Measurement Workshops presented by J. Benga, W. C. Golton, and K. H. Fujimoto continue to provide valuable hands-on training for the accurate determination of VOCs using U.S. EPA's Reference Method 24. The May 1-2, 1996 workshop, held at ICI's laboratories, Strongsville, OH, was a great success. The next workshop is planned for November 6-7, 1996, City of Industry, CA with the South Coast Air Quality Management District (SCAQMD) Laboratory acting as the host laboratory. Once the host labs are identified, our schedule to November 1997 will be announced.

D01.21.15—EPA/ASTM Liaison—K. H. Fujimoto, Chair. At the first meeting with 17 members and three guests in attendance, E. A. Praschan has agreed to act as Vice Chair. D01.21.15 was formed at the last meeting in January 1996 to foster a working relationship between the U.S. EPA and D-1 which will effectively expedite the acceptance of improved and new environmental test methods for coatings developed by D01.21, and allow ASTM to actively assist the EPA in meeting regulatory objectives.

The ASTM test methods used in U.S. EPA's Reference Method 24 have been improved since their inauguration back in the late 1970s, but government references are still made to the outdated test methods. It is the hope of D01.21.15 to report these improvements to the EPA and to recommend their acceptance since they improve the accuracy of the individual test methods.

E.A. Praschan explained the present management set up in the Measurement Center of the EPA and the many new personnel who have no idea about the function, purpose, or objective of ASTM. For this reason, he recommends the first meeting with the EPA be a low key "get-to-know each other" affair where some of the activities of D-1 can be elucidated, as well as, a presentation on the structure and function of ASTM.

To carry out this goal, it was recommended a small delegation go to Research Triangle Park, N.C. around August 6 or 7 to present the following tentative agenda: (1) ASTM Overview, S. Orthey or other ASTM representative; (2) D-1, Scope, Organization, activities, S. Orthey or other ASTM representative; (3) Environmental Concerns, E. A. Praschan; (4) ASTM Relationship, J.C. Berry; (5) D01.21s Analytical Activities, K.H. Fujimoto; (6) Technical Issues, Limitations, and Concerns, J. Benga; (7) VOC Manual MNL 4, Description-Status, J.J. Brezinski; (8) Paint VOC Training Workshops, W.C. Golton; (9) EPA's Perspec-

tives and Needs, W. Lamason and J. Bosch; (10) EPA Participation Alternatives, Group; (11) Conclusion and Follow-up, Group.

The meeting will be scheduled so that the ASTM participants can fly in and fly out on the same day. Vice-Chair E. A. Praschan will contact the U.S. EPA, to make the final arrangements. After this initial contact, a two-day formal technical presentation will be planned, at a later date, in which all D01.21.15 members can participate in conjunction with the U.S. EPA's presentations.

D01.21.25A—Oven VOCs Available For Abatement—L.E. Pattison, Chair, started with a review of the scope of the method under development and what has been done to date. The method is being developed to measure the amount of VOCs available for abatement in a production facility for waterborne coatings.

Chrysler is working on an in-laboratory test rather than having to perform the test in the plant. The original method, which used an aluminum foil paint surface, is being used. A round-robin to evaluate the spraying variations is in progress. Both PPG and BASF are conducting the round-robin study with Chrysler

The test panels, 4 in. x 12 in. panels, are wrapped in weighed aluminum foil. They are sprayed with automatic spray machines, 65 PSI, 1,000 in./min, @ 75 ± 2°F, 65 ± 2% RH. After spraying, the folded foil are placed in tared jars containing solvent and internal standards. Gas chromatography (GC) samples are then made from the paint/solvent mixture. The test sample is a white basecoat supplied by BASF. After the initial GC test, runs are made with the sample, PPG and BASF will exchange samples and run them to ascertain whether they can duplicate each other's results and to check on the accuracy of the method. The initial round-robin is expected to be completed by mid-July. If and when the data are analyzed, all reported parties will be notified about the results. It is the hope of the chair to have an ASTM formatted method available for the next meeting in January 1997.

D01.21.26—Review of D 2369, Percent Volume Nonvolatile, Use of Helium Gas Pycnometer—K.H. Leavell, Chair. In the absence of Chair K.H. Leavell, R.D. Brockhaus, temporary chair, said the first order of business was to discuss L. Schaffer's letter suggesting a simplification of the calculations used to derive percent volume nonvolatile. D01.21.26 noted that wet sample density is currently expressed commercially in units of pounds per gallon and analytical devices are used which read out directly into these units. Other changes

would be required to report the results as g/mL

D01.21.26 found the suggested change to Section 7.4 not persuasive. However a footnote, Note 6, will be added to read: "If the wet sample density is determined by a device directly reading out in g/L, the following equation can be used which generates identical % VNV results: % VNV=(weight % NV) X wet coating density (g/mL)/dry film density (g/mL). A letter will be sent to Mr. Schaeffer explaining these changes.

A copy of the latest draft was distributed. It was found to be missing a page, Sections 5.8 to 6.8, which prevented a full examination of the document. D01.21 Chairman K.H. Fujimoto stated the revised method had been sent in for the next D01.21 and D-1 ballots. However changes made by D01.21.26 should be incorporated, as soon as possible, and before the balloting.

The changes made to Section 4.1, Notes 1 and 2, which address a comment on the type of volume actually measured by the helium gas pycnometer, was discussed and accepted by D01.21.26. This refers to the "skeletal or absolute volume" where pores and internal voids are displaced with helium gas and not counted as part of the volume.

W. S. Zimmet had pointed out the "Significance and Use" statement states the method will be used to determine coverage and the helium gas pycnometer is recommended because it fills coating voids especially in high PVC paints. The problem is the voids are part of the film and contribute positively to aid in the coverage and should be included. By filling all voids, the helium gas pycnometer gives a maximum value for density, minimum value of coverage, and percent VNV. This method cannot be used for coatings with substantial void volume.

K.H. Fujimoto distributed a flyer on Micrometrics' GeoPyc instrument which determines "envelope" volume and does not displace the air or trapped gases in the pores and internal voids. By subtracting the absolute volume from the "envelope" volume, the total pore volume can be determined. This information would be of value in measuring the void volume.

It was recommended that the GeoPyc instrument be evaluated by the D01.21.26 as its next project. Other changes noted and agreed upon by D01.21.26 are: (1) Section 4.1, Note 2: P/B to be fully written out as "Pigment to Binder Ratio (P/B)". (2) Section 5.1 and 5.4: edit both to remove references to suppliers which are not single source suppliers of the items described as apparatus or reagents. This

is in keeping with the new ASTM Rules introduced Sunday, June 23, 1996. (3) Section 5.3: allow to remain as is since there is only one manufacturer of the item described. (4) Section 5.1: replace the section "5 mL cup" with "suitably sized cup" and add a Note 4 which will read "The data from the round-robin was obtained using a 5 mL cup. This permits future use of other cup sizes with equipment producing equal operational performance." (5) Sections 6.11, 6.12 and 6.15 should be changed from "5 mL cup" to "sample cup". (6) Section 6.15: last half of the sentence moved out to make step 6.16.

All changes discussed and noted here are editorial in nature and does not affect the validity of the method. This should allow the draft to continue on with current balloting activities.

D01.21.51—Determination of Formaldehyde in Paints—D. O. McCuun, Chair. The goal of D01.21.51 is to develop a method to measure the amount of formaldehyde evolved from a coating under specified laboratory conditions. The proposed method and experimental data, which showed poor recovery, was distributed to D01.21.51. The major problems appear to be the lack of a valid stable standard paint since studies show a decrease in recovery of formaldehyde as the sample ages. However, the approach does seem to measure formaldehyde evolved from aqueous standards.

The discussion on future plans centered on initiating a round-robin to determine the repeatability of the method. This would measure the precision of the method, i.e., measure the amount of formaldehyde emitted by the test samples without concern as to the percent recovery of the spiked formaldehyde.

The concern that the test samples change concentration over time will be addressed by instructing all of the collaborators to run the samples at the about the same time or using "aged" samples which should not be changing concentration of formaldehyde.

D01.21.52—Paint Solvent Analysis by Gas Chromatography—J. Benga, Chair. After a brief review of a direct injection capillary GC procedure for solvents/HAPs determination, data from the recently conducted round-robin study was presented. Data from four laboratory (six analysts) were received, but not in time to do an E 180 precision evaluation. There are still a number of laboratories that indicated they were in the process of analyzing the six samples sent out to them in late April. The final data analysis will be held off until July 20, 1996 in order to give these laboratories an opportunity to submit their data.

Initial analyses of the data received to date indicate somewhat poor agreement within laboratories, but none-the-less, D01.21.52 agreed, after some minor changes, to submit the method for D01.21 ballot. This will give enough time to review the feed back or comments by the next January 1997 meeting.

D01.21.52A—Hazardous Air Pollutants (HAPs) by HS/GC/MS—S. Ramesh. In the absence of Chairman S. Ramesh, K. H. Fujimoto acted as temporary chair. Comments by S. Ramesh plus copies of the proposed test method were distributed to D01.21.52A. The chair comments were: (1) There were no results to report. (2) D01.21.52A collaborators are testing the same paint samples used by D01.21.52 "Paint Solvent Analysis by GC." (3) The method needs clarification and simplification. (4) The reference standards have to be redefined. (5) Some attempts were made to develop an internal standard method which would simplify the calculations. (6) The internal standards used in the GC method could not be used. (7) Attempting to establish a technique whereby Relative Response Ratio (RRR) of all the compounds can be determined in one run. (8) Experimental variations (like headspace sampling variations, GC errors and mass spectral sensitivities) do not cause errors in the final calculations. (9) The 3 mL head space sample loop gives overload conditions on both GC and MS if the percent volatiles is over 30%. (10) Lower sample size gives better linear correlation. (11) Tried to make reference standard blanks by stripping out the volatiles from the paint matrix, but it formed an insoluble product. A different matrix must be found. (12) Change headspace condition from 110°C to 130°C.

Some of the comments received from D01.21.52A were: (1) There was a question about the scope of this method. Is it HAPs or VOCs D01.21.52A trying to determine with the HS/GC/MS? If it is VOCs, the better approach would be thermal extraction/GC/MS. (2) If there is a problem of sample overload with the 3 mL sample loop, do a split injection and not splitless. (3) Even though the HS/GC/MS is a powerful tool, if used properly, the test parameters under study will probably not work. For most paints, total evaporation of the volatiles is not possible in a sealed vial @ 110°C no matter how long it is heated. (4) For water based paints, the optimum sample size for total vaporization is too small to accurately measure. (5) The analysis is very matrix dependent. To get around matrix effects, equilibrium problems, volatilization efficiencies, and a bunch of other things, the system can be swamped with a common matrix such

as a nonvolatile, very low pressure plasticizer. Tritolyl phosphate works real good, but there are safety, health, and disposal issues. PEG 400 may work for some things, but it would not be an optimum choice. (5) The use of 0.1-0.5 g specimen and 5 g diluent can minimize the matrix effects, and under these conditions, standards can be prepared without too much problems. (6) The 130°C temperature is still not high enough to minimize matrix effects and to achieve complete vaporization for a number of common paint/coating systems.

D01.21.54—Water in Paints by Karl Fischer Method—W. C. Golton, Chair, reported an interlaboratory study was presented in which the "Methanol Extraction Method (Appendix XI of D 4017) and a proposed new method, the "Homogenizer Method" were evaluated. Results from both methods were excellent.

Summary of the Methanol Extraction Method (XI): (1) specimens are weighed into volumetric flasks and diluted with anhydrous methanol; (2) water is extracted into methanol by sonification; (3) titration is done in pretitrated methanol; (4) titrant is Hydranal® Composite 5 or equivalent; (5) a blank value is determined for the anhydrous methanol; (6) 1-10 mL aliquots pipetted from the volumetric flasks and titrated and; (7) percent water calculation must be corrected for blank value.

Summary of Homogenizer Method (X2); titration is done in pretitrated methanol; a "dummy" titration is run and discarded; small specimens are weighed into the titration vessel (to contain 30-59 mg water); the vessel contents are homogenized for 30 seconds prior to the titration; and Hydranal® Composite 5 or equivalent is used as the titrant.

Appendix XI was revised to add the new precision statement. The new "Homogenizer Method" was added to D 4017 as Appendix XI. The two appendices were balloted concurrently on D01 (96-01).

A negative vote and comments were received from R. D. Brockhaus, and editorial comments were received from W. S. Zimmt. Brockhaus's negative related to Appendix X2, the "Homogenizer Method." He proposed a larger specimen size and starting the titration at the same time as the homogenizer, thus one minute sooner. After a short discussion, he agreed to withdraw the second objection and the negative provided a footnote be added which states other specimen sizes may be used.

Chair Golton recommended the approval of most of the comments received since their incorporation would improve the method. They will be placed in the

next revision of the method. Data obtained from the interlaboratory study will be submitted as a Research Report to the ASTM Headquarters. With the incorporation of these revisions, D 4017 will offer three options for the determination of water in paints by the Karl Fischer Method. The revised method is expected to appear in the 1997 *Book of ASTM Standards* as D 4017-96A.

D01.21.55—Exempt Solvents in Paints by Gas Chromatography—J. Benga, Chair. After a brief review of a direct injection capillary gas chromatographic (GC) procedure for acetone determination, the data from the recently conducted round-robin study was presented. Even though data was received from seven laboratories (nine analysts), there are still a number of collaborators out there working on the five test samples. E 180 precision analysis of the data received so far show repeatability of ~12% and reproducibility of ~30%. Since some of the participating laboratories may not have been familiar with the type of samples used in the round-robin, the data was re-evaluated using data from select, "qualified" laboratories. Using this approach, the apparent precision improved to 6.5% repeatability and 17% reproducibility.

As a point of interest, two of the participating laboratories, South Coast and Bay Area AQMD reported data very favorable both in terms of precision and values close to theoretical. Also, BAAQMD presented data using their own Method 22 which gave results comparable to the proposed method.

D01.21.52 agreed to the following action: tighten up the proposed method for the determination of acetone by incorporating comments received from the collaborators; rewriting the method into ASTM format; submitting the proposed method for D01.21 ballot. In this way, D01.21.52 will receive feedback by the January 1997 meeting in Ft. Lauderdale. J. Benga extended his appreciation to all the collaborating laboratories and to R. C. Matejka for providing some of the paint samples.

D01.21.56—Revision of D 3960, "Practice for Determining Volatile Organic Compounds (VOC) Content for Paints and Related Coatings"—M.E. Sites, Chair, reported this standard practice provides a guide to appropriate ASTM Test Methods and the calculations needed to determine VOC results required by many government regulatory agencies. This practice has undergone numerous revisions since it was first issued in 1981, in order to, incorporate changes in VOC regulations or test methods.

The latest revision, D 3960-96 was published in March 1996, and it is avail-

able as a separate from ASTM Headquarters. The new revision will appear in the 1997 *Book of ASTM Standards, Vol. 06.01*. A new revision of the practice will be balloted on the D01.96.03 ballot. This will include the following: (1) Reference ASTM D 3925, "Practice for Sampling Liquid Paints and Related Pigmented Coatings." This is important since accurate sampling is the most important step in VOC measurement; poor samples give poor results. (2) Paragraph 7, "Water Content" will be rewritten to show D 4017 offers three options for determining water content by the Karl Fischer Method. These are the standard titration in pyridine, extraction of water from a latex paint with anhydrous methanol before titration with a non pyridine reagent, and the use of a homogenizer accessory before titration with a non-pyridine reagent. (3) Update Section X3, 1.1.1, Appendices, which cites exempt solvents. Exempt solvents such as acetone need to be added to this list.

D01.21.80—Exploratory Analytical Chemistry—K.H. Fujimoto, Chair, extended his appreciation to C.B. Choa, SCAQMD's Analytical Lab Chief and R. Zerrudo, BAAQMD's Head of the Analytical Service Lab for participating in our group activities. Their knowledge and experience are of great value to D01.21.

After the minutes of the last meeting were read, the formation of D01.21.15 EPA/ASTM Liaison was announced. This group includes: J.C. Berry, K.H. Fujimoto, W.C. Golton, J. Benga, E.A. Prashan, K.H. Leavell, D. Mahoney, J.S. de Wit, M.E. Sites, J. Phillips, and M. Harding.

The method developed by K.H. Fujimoto and approved by the U.S. EPA on "Test Method for Volatile Content of Fast Cure Multicomponent Paints" was distributed. D01.21.56 voted to place the method on the next D01.21 ballot. This method represents a modification of D 2369. These multicomponent systems cure within two-five minutes with only 3-11% volatiles. The components are weighed and mixed directly in the aluminum weighing pan. No diluents are used since they stop the curing reaction.

The wood furniture manufacturers are reporting their VOCs as # VOC/# Solids. Since there is no written ASTM method, a new D01.21.56A, "VOC as #VOC/#Solids" was formed to be chaired by R.C. Matejka. Members of D01.21.56A are: M.E. Sites, R.D. Osterman, J. S. de Wit, C.B. Choa, W.C. Golton, and J. Benga. D01.21.56A will work out the details and procedure to calculate VOCs on a weight/weight basis.

Subcommittee D01.22 Health and Safety R. D. Osterman, Chair

D01.22.01—Flash Point and Combustibility—R. Montemayor, Chair, reported that verification fluids for flash point testers are available from NIST. Contact NIST for further information.

D01.22—R. D. Osterman, Chair, opened the meeting with a discussion that focused on the negative votes received on D 1310, "Test Method for Flash Point and Fire Point by Tag Open Cup Apparatus." All negatives were found persuasive as the test method is currently in use. Test Method D 1310 will be withdrawn from ballot and will be resubmitted as a reappraisal.

A new task group will be added—D01.22.04 in coordination with ISO/TC 35. The aim of the task group will be to coordinate some of the test methods that are the responsibility of D01.22 with similar methods under ISO/TC 35.

Subcommittee D01.23 Physical Properties of Applied Paint Films P. R. Guevin, Jr., Chair

D01.23.10—Adhesion—G.L. Nelson, Chair, discussed new text for Section X1.6.2 in D 3359, "Test Method for Measuring Adhesion by Tape Test." It was the decision of the task group that the new text be balloted.

The D01.23 (96-01) ballot to revise D 5179, "Test Method for Measuring Adhesion of Organic Coatings to Plastic Substrates by Direct Tensile Testing," received no negatives. The ballot adds Test Method D 4541 and ISO 4624 as referenced documents and a commentary.

Prior to the last meeting, D 2197, "Test Method for Adhesion of Organic Coatings by Scrape Adhesion," was balloted for withdrawal. A number of negatives were received. Several issues remain unresolved. Two current manufacturers are not using a chrome plated U-Shaped stylus. One uses no plating while the other uses a nickel plating. P. Guevin is presently organizing a round-robin on currently used and chrome plated styli. It was recommended that D 2197 be revised to specify styli agreed upon between supplier and user. It was further recommended that the precision and bias statement be modified to reflect the current status of the round-robin.

D01.23.12—Dry Film Thickness—S. K. Boock, Chair, reviewed the standards under its jurisdiction as well as comments received on the balloting of both D 1186, "Test Methods for Nondestructive Measurement of Dry Film Thick-

ness of Nonmagnetic Coatings Applied to a Ferrous Base," and D 1400, "Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base." The task group chair has the data from the recently completed round-robin on dry film thickness measurements and will submit the data to obtain an analysis for the Precision and Bias statements from both methods and develop a research report.

For Test Method D 1186, the current wording on frequency of checking of the calibration of a gage will change. The user will no longer be required to check gage calibration at the beginning and end of each work shift.

D01.23.14—Hardness, Abrasion and Mar Resistance—A. F. Rutkiewicz, reported that Draft #3 of the proposed "Test Method for the Dry Abrasion Mar Resistance of High Gloss Coatings" resulted in two negatives and various editorial comments. The negatives were found persuasive and will be addressed in a revision.

The execution of a round-robin to evaluate the effects of various modifications to the mechanical design of the Taber Abraser did not take place. Three laboratories will coordinate along with Cytec Industries in the execution of the round-robin prior to the next meeting.

P. Guevin will define the chrome plate material specifications and obtain specimens of the styli required for D 5178, "Test Method for Mar Resistance of Organic Coatings." A round-robin of this method will be organized at the next meeting.

There was no agreement between the manufacturers of the Sward-Type Hardness Rocker used in D 2134, "Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Harness Rocker," on the detailed dimensional specifications of the component rings of their instruments. A new approach is required. The manufacturers were directed to provide detailed dimensional specifications of their instruments. These will be included in the method as Sward-Type Hardness Rocker "A" and Sward-Type Hardness Rocker "B," so that the users of the method can report the instrument used and understand that the instruments do not provide comparable results.

D01.23.15—Slip Resistance—P. R. Guevin Jr., Chair, reported that negative votes were received on Item #2, Reapproval of D 4518-91, "Test Methods for Measuring Static Friction of Coating Surfaces," Item #3, proposed "Test Method for Determining the Coefficient of Friction of Coated and Other Like Surfaces Using a Portable Inclined Ar-

ticulated Strut Slip Tester," and Item #4, Revision of D 5859-96, "Test Method for Determining the Traction of Footwear on Painted Surfaces Using the Variable Incidence Tester," of DO1 (96-02) ballot. The negative votes were considered to be persuasive by the chair. He agreed to revise the test methods in accordance with their rationale and resubmit them to ballot.

The chair discussed actions taken by F-13 regarding test methods to measure slip resistance in other committees. He reported that F-13 did not pursue any further criticism of slip resistance test methods from D-1. However, F-13 brought to the attention of the Committee on Standards (COS) their complaint of the addition to the scope of D 2047, "Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine." Test Method D 2047 is under the jurisdiction of D- 21 on Polishes. D-21 added the phrase "... the test method is suitable for laboratory testing of other types of coatings and finishes, as well as uncoated resilient, mineral, wood and metal flooring..." F-13's contention was that this phrase exceeded the scope of D-21. Guevin reported COS agreed with F-13. COS asked D-21 to remove the phrase. Guevin said the Maple Flooring Manufacturers Association currently specifies Test Method D 2047 to be used to test the slip resistance of organic coatings over maple gym floors.

D01.23.19—Drying Time—T. J. Sliva, Chair, reported that D 5895, "Test Method for Measuring Times of Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders," had successfully completed society ballot.

The chair reported that round-robin data for both D 1640, "Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature" and Test Method D 5895, using a straight line recorder have been completed. The precision and bias statements for these methods will be developed.

The initial results from the round-robin using the circular drying time recorders were reviewed. Three more cooperators have agreed to participate in the round-robin. The data is being developed using one hour recorders supplied by the Paul N. Gardner Co. The chair will report the results of this round-robin at the June meeting.

D01.23.20—Exploratory Research—P.R. Guevin, Jr., Chair, reported that three negative votes were received on Draft #3, "Proposed Test Method for Nondestructive Measurement of Dry Film Thickness of Organic Coatings Applied to a Base Using an Ultrasonic Gage,"

Item #25 of D-1 (96-01) ballot. The task group agreed that the negative vote from H. Picketts was persuasive as the proposed test method did not inform the reader how to report substrate roughness specified in section 9.1.1. It was agreed that the item would be withdrawn from ballot, revised accordingly, and resubmitted to D-1 ballot.

D01.23.21—Contact Angle Measurement—V. Scarborough, distributed Draft No. 2 of the proposed method for review. After discussion the group agreed the title of the method shall be "Test Method for Determining Water Wettability of Coatings by Contact Angle Measurement." Other suggestions for change included altering the significance and use statement to include some of the limiting factors associated with measuring contact angles on coatings. Following review of the method, the chair asked for cooperators to initiate a round-robin. Sample test panels were distributed among a total of six cooperators. The results will be discussed at the next meeting.

Subcommittee D01.24 Physical Properties of Liquid Paints C.K. Schoff, Chair

D01.24.18—Dispersion Phenomena—R.K. Morrison, Chair, discussed the revision of D 1210, "Hegman Gage Type Fineness of Dispersion of Pigment-Vehicle Systems." This method has been extensively revised, a new texture gage added, and illumination source described. The chair reviewed the 1978 research report for precision for the current published method which pooled data from two different gages. This pooling is one reason for the poor precision of the method. The data for the two gages will be separated; data will be collected for the new texture gage, and a precision statement written for each gage. If there is enough interest, new precision data will be collected for all three gages, not just the new one.

The recent D-1/society ballot on the revision of D 1210 had resulted in four negatives and several comments. Some editorial changes have been made and the negatives have been withdrawn. So the method has now passed the final hurdle and will be published as revised—just in time to avoid being removed from the book in 1997.

D01.24.19—Viscosity by Efflux Cups—C. K. Schoff, Chair, discussed the most recent version of D 4212, "Viscosity by Dip Type Viscosity Cups," which will be submitted for D01.24 ballot. The linear viscosity-efflux time equations for calibration (to be changed to validation,

these devices are too crude and imprecise to be truly calibrated) were questioned and their origin will be determined. Also, the substitution of other, possibly more accurate, equations will be considered. D 1200, "Viscosity by Ford Cup," was discussed briefly. M. J. Sherret of Stanhope-Seta presented information on the Seta Autoflow Tester for temperature control and viscosity measurement with Ford and ISO cups. The final revision of D 5125, "Viscosity of Paints and Related Materials by ISO Flow Cups," was handed out along with copies of ISO 2431, the original ISO Cup method. D 5125 will be submitted for D-1 ballot.

*D01.24.20—Rotational Viscometers—*The meeting began with discussion of the revision of D 2196, "Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer," which has drawn several negatives and comments on recent D-1 ballots. The revision was undertaken in order to add the newer digital Brookfield Viscometers and clones made by other companies. The discussion centered on the need for making the method more generic, yet still limiting it to Brookfield and Brookfield-like viscometers. More rewriting must be done before this method can be resubmitted for D-1 ballot.

The group then discussed D 4287, "Viscosity at High Rate of Shear by ICI Cone/Plate Viscometer," which also needs to be made more generic. Two other high shear viscometers similar to the ICI exist, the Sheen cone/plate and Brookfield CAP 1000. The Brookfield CAP 2000 also covers the ICI shear rate of 12,000 s⁻¹. All of these viscometers are digital. It was decided to continue to restrict the method to the ICI cone/plate and instruments similar to it and to undertake interlaboratory testing to develop precision data for the digital cone/plate viscometers.

*D01.24.21—Viscosity by Stormer™ Viscometer—*Discussed the major revision of D 562, "Viscosity by Stormer-Type Viscometer." D. W. Howard had made additional changes to incorporate a number of H. E. Ashton's comments. The main reason for the revision is to add the new digital Stormer-Type viscometers to the method and to incorporate a new precision statement. R. D. Brockhaus volunteered to work all of the changes into a coherent document and submit it for D-1 ballot.

*D01.24.22—Density—*Discussed the revision of D 1475, "Density of Liquid Coatings, Inks, and Related Products." The latest draft includes a number of changes and corrections suggested over the years by H.E. Ashton. The chair was asked to add three methods or practices

to the Referenced Documents section and to submit the revised method for D-1 ballot. A. Cohn, of Sherwin Williams, presented information on a centrifuge method for use in weight per gallon measurements. This modification of the basic density method (really a change in the specimen preparation portion) appears to give better precision than the current method. It could be added in the Appendix.

D01.24.33—Odor Evaluation—D. E. Darr, Chair, discussed the proposed Guide to the Detection and Identification of Odors of Paints, Inks, and Related Materials." The latest draft looked good and will be submitted for D01.24 ballot.

*D01.24—*No meeting to discuss the vote to reapprove D 5201, "Practice for Calculating Formulation Physical Constants of Paints and Coatings," had been scheduled because reapproval of the method had been expected. However, there was a negative which was discussed at the D01.24 meeting. E. A. Praschan had planned to meet with the negative voter, but was unable to do so. The voter will be contacted by telephone. The negative raised a number of good questions regarding the rounding off of numbers, the need for the inclusion of definitions of terms (which may be in D 16 or could be added to it), whether solvent includes water or not, and how ammonia was to be handled in the calculations. The negative appeared to be persuasive which would mean that the method would have to be revised and rebalotted.

The chair indicated that he was resigning after 18 years on the job. The new chair is R.D. Brockhaus, of DuPont, who will be looking for some task group chairs to help him out.

Subcommittee D01.25 Evaluation of Weathering Effects and Coatings Defects M. J. Crewdson, Chair

D01.25.01—Pictorial Standards—M. J. Crewdson, Chair. Coordination between ASTM and the Federation of Societies for Coatings Technology (FSCT) for the Coatings Defect Handbook is of direct concern to this task group. No contact has yet been made between D01.25 and the FSCT.

D01.25.02—Visual Evaluations—M. J. Crewdson, Chair, reported on the results of the recent D01.25 ballot of D 4214, "Evaluating Degree of Chalking of Exterior Paint Films." With three affirmative and one abstention, the draft will go forward to concurrent D-1 and society ballot. However, due to the fact that the

membership roster of D01.25 has not yet been fully updated, the ballot was not received by those who might be most interested. It is imperative that the members pay close attention to the next main committee ballot in order to register their comments. Comments from E.F. Praschan were editorial and will be incorporated.

R.K. Morrison passed around a copy of the ISO photographic reference for chalking. In the next revision, this will be balloted as a replacement for the TNO standard currently used in D 4214. The ISO and TNO photographs appear to be identical, and the ISO photographs are readily available whereas the TNO are not. Multisource listing of test apparatus and equipment is no longer permitted under new ASTM regulations. This is a problem in the sourcing for the tapes used in tape chalk testing. Once the ISO tape test replaces the TNO method in D 4214, a single tape source must be specified.

A single standard combining all of the visual evaluation methods will be developed. M. J. Crewdson, J. Martin, L. Jacques, and G. Rommal have volunteered to work on this project.

D01.25 discussed a proposal to write a guide for reporting evaluation results. It was the consensus of the committee that these types of instructions would be better suited to the report section of the new combined evaluation standard.

A new standard to quantitatively rate mildew and dirt attachment is needed and will be developed by a new task group. This will be used in conjunction with a revised D 3274 which will be modified by D01.28 to concentrate on the qualitative aspect of species identification.

D01.25.03—Image Analysis—L.F. Jacques, Chair. A questionnaire was circulated to all attendees at the meeting. The questionnaire was designed to help determine the direction of the committee for the development of an image analysis standard. It was suggested that a general practice be written for "Image Analysis Coatings" to encompass general procedures, followed by specific test methods where the nature of the measured defect dictates special procedures be used. A short presentation was made, identifying the important points in the questionnaire, and their relation to the development of a standard. This questionnaire will be circulated to all members of D-1 at the next general mailing.

It was also suggested that an equipment fair be held at the next meeting so that committee members could view what equipment is now available and how it could be used to perform imaging tasks relevant to the scope of D01.25. The mini round-robin on chalking was

conducted using a group of 48 panels supplied by R. K. Morrison. Fourteen volunteers assisted in the testing. Each person was asked to make a chalk rating on eight panels that were randomly selected from the larger group. The felt chalk swiping method B of D 4214 was chosen as this is the most widely used technique. The results will be collated and analyzed and a report will be made at the next meeting.

D01.25—Items A new task group designated D01.25.04 Mildew Evaluation was formed. This group will develop a new standard on mildew evaluation, and will work closely with D01.28 on coordinating these efforts with the revision of D 3274.

Subcommittee D01.28 Biodeterioration J. S. Hinkle, Chair

D01.28.02—Rapid Determination of Enzymes—is still seeking a new chair to replace C.W. Vanderslice who resigned at the January 1996 meeting. This replacement remains an area D01.28 believes is important to address, but no one is able to take on the responsibility at this time.

D01.28.03—Microbial Quality of Raw Materials—M.C. McLaurin, Acting Chair, for J. S. Hinkle. Section 11 of D 5588-94 was changed to agree with the new rating system adopted in D 2574-96, Section 7, for degree of microbial contamination. This was an editorial change only.

D01.28.04—Resistance of Paint Films to Algae Attack—K.P. Roberts, Chair. The task group continued its discussion of proposed revisions of D 5589-94 begun at the January 1996 meeting. Technical revisions made include expanding the list of algal species to more closely reflect organisms found on paint and coating films and changing culture maintenance procedures to include the standard practice of growing algae in broth cultures. Two topics of lengthy discussion were coating application and UV weathering. Both issues are addressed by other subcommittees. We agreed, however, to add a caution that the use of UV-B lamps in weathering may adversely affect organic algicides more than UV-A lamps. These changes, as well as some editorial corrections, will be incorporated by the chair and circulated to D01.28 prior to the next meeting.

D01.28.05—Correlation of Exterior Versus Accelerated Fungal Tests—M.C. McLaurin, Acting Chair. J.S. Hinkle requested the members send him any data they have comparing exterior exposure tests with laboratory evaluations. He is presently conducting a small (four coat-

ings) comparative study. A round-robin comparing D 3273 and D 5590 with exterior tests is under consideration.

D01.28.07—Revision of D 3274 (defacement ratings)—M. C. McLaurin, Acting Chair, discussed the need for improved visual aids to assist in rating the defacement of exterior coatings. This discussion was a continuation from the January 1996 meeting. All agreed we need photos or images that are more representative of field samples than the current photos. B. Matta, former Chair, and M. Crewdson discussed similar efforts in this direction taking place within a new D01.25 subcommittee. We discussed the possibility of moving the method from D01.28 to D01.25, since we are trying to resolve similar issues. All agreed, however, that we need to keep control over the biological aspect of the rating system. The approach decided upon will be for D01.28 to revise D 3274 and reference the new D01.25 standard when it is approved. The need for liaison between the two groups became obvious, and B. Matta agreed to fill that role. B. Matta will also serve again in a limited capacity as D01.28.07 Chair.

D01.28—Biodeterioration—M.C. McLaurin tendered his resignation as Chair because of new career responsibilities. J. S. Hinkle will take over the Chair and V. King will serve as Vice Chair. K. P. Roberts agreed to serve as Secretary. This was a well-attended meeting and all agreed that the lively discussion and sharing of ideas was useful.

DIVISION 30 PAINT MATERIALS

Subcommittee D01.31 Pigment Specifications D. E. Kesatie, Chair

D01.31.08—Titanium Dioxide—D.E. Kesatie, Acting Chair, called the meeting to order with seven members and two visitors in attendance. A discussion took place regarding the current titanium dioxide standard with Manfred Wehner, Chair for ISO/TC 35/SC 2. It was suggested that users be contacted for their input to try to develop a more meaningful standard. It was also suggested that Chair C. C. Tatman coordinate the development of a possible world-wide standard with the appropriate ISO representative.

D01.31.10—ISO Pigment Coordination—R. Schiller, Chair, called the meeting to order with nine members and two visitors present. Chair R. Schiller introduced Manfred Wehner, Chair for ISO/SC 2. ISO/SC 2 is the pigments and ex-

tenders subcommittee. M. Wehner explained that the 93 standard work load, as well as the voting procedure, was being handled by the seven working groups. D. E. Kesatie, D01.31 Chair, explained his subcommittee and voting procedures for the benefit of our guests. The concordance of the test methods and specifications between the two organizations was discussed and copies were distributed to those in attendance. It was suggested that new ASTM standards be cross referenced to ISO standards in the blue document.

D01.31.12—Zinc Pigments—D.E. Kesatie, Acting Chair, called the meeting to order with nine members and two visitors present. A zinc phosphate specification with a revised table of analysis for zinc content, Phosphate content, and loss on ignition was submitted to D01.31 for D01.31 ballot and also submitted for editorial review. There was no new information regarding the 0.06 load level in zinc dust.

D01.31—Under old business, 19 standards were placed on the D-1 ballot for reapproval. Negative votes were received on D 1208, "Test Method for Common Properties of Certain Pigments," D 211, "Specifications for Chrome Yellow and Chrome Orange Pigments," and D 2218, "Specifications for Molybdate Orange Pigments."

Under new business, negative votes received for D 211, "Specifications for Chrome Yellow and Chrome Orange Pigments" and D 2218, "Specifications for Molybdate Orange Pigments," were found not persuasive. Negative votes received for D 1208, "Test Method for Common Properties of Certain Pigments" was found not persuasive. Section 5.1 refers to the use of an asbestos filter pad. D01.31 discussed that possibly the wording could be changed to state "the use of a suitable filter pad." D01.31 members objected to the Committee on Standards decision not allowing material and or equipment suppliers to be listed in specifications. There are 27 standards requiring action. D. E. Kesatie will mail a list to all D01.31 members to review these standards. Suitable stewards will be found for any standard that cannot reviewed by D01.31 members.

Subcommittee D01.32 Drying Oils J.C. Weaver, Chair

The five attendees briefly discussed negative votes on D01 (96-01) ballot to withdraw D 1963 on specific gravity without replacement. We agreed unanimously to ask for rebalot for reapproval of D 1963 and to coordinate with D01.24

on the relative precision of D 1963 and D 1475 on density by the metal weight per gallon cup for various materials versus D 1963 on specific gravity by several models of glass pycnometers. Compare these with ISO/TC 35/SC 9's ISO 2811—Determination of Density by glass pycnometers. We noted vast changes over many decades from D01.32's formation in the structure of the drying oil industry, and in the paint industry uses of drying oils and of fatty nitrogen derivatives. We will seek anew coordination with the analytical committees of the American Oil Chemists Society to modernize in commonality with them D01.32's 58 standards, and to recruit into D01.32 bonafide representatives of major producers and users.

Subcommittee D01.33 Polymers and Resins J.G. Lamberton, Chair

J.C. Weaver, Chair Protem, and eight members and guests discussed negative vote resolutions, Emulsion Polymer Council's concerns over VOC regulations by EPA. Reorganization of D01.33 was discussed as well as recruitment of members and stewards. ISO/TC 35/SC 10 on Polymers/ D01.33 mutualities. Negative votes on the D-1 (96-01) ballot for automatic withdrawal-without-replacement of 13 of D01.33 standards drew 79 negatives from 10 D-1 members plus affirmatives-with-comments from three D-1 members. They all offered nearly identical opinions that these 13 standards should be rebalotted for reapproval to allow time for detailed modernization. Unanimous approval of this opinion was voted and offered to the D-1 staff manager for action along with D 1306 (alkyd analysis), also overdue. The Emulsion Polymers Council, formed in 1996, comprises environmental managers and associated analytical chemists employed by nine major producers of latexes which are media for very large volume production of paints. They asked D01.33 to develop standards for measuring VOCs, volatile organic concentrations, where the high content of water tends to obscure the quantitation of the small percentages of diverse organic coalesces, surfactants and other small additives and subject to the surveillance of EPA Method 24. Those analytical chemists will be welcomed into D01.33. Reorganization of D01.33 to evaluate the relative obsolescence of some of D01.33's eleven standards on analysis of alkyds may be effected by recruitment from the several major producers and users of alkyds. J.C. Weaver's May 14 letter, to chair J.G. Lamberton, attempted to classify D01.33's 52 standards into about 10 major groups. Specialists for each group

will be recruited to become stewards to study each of the 52 for modernization. ISO/TC 35/SC 10 on Polymers has a new Chair, Oldrich Horak. His presence in this D01.33 meeting was most welcome and foretells mutual cooperation.

Subcommittee D01.34 Naval Stores J. Russell, Chair

D01.34.01—Capillary Gas Chromatography of Rosin and Fatty Acids—W. Trainor, Chair, announced that the method had passed a D-1 ballot with no negative votes. Comments, which were primarily editorial, were discussed. It was agreed that whenever possible, these changes would be incorporated into the text during the editing process. It is expected that this standard method will be published as a 1996 standard. It was also agreed to withdraw D 3008, "Test Method for Resin Acids by Gas Chromatography," by ballot now that the new GC method is scheduled for publication as a standard.

D01.34.05—Softening Point of Rosin and Rosin Derivatives—P.S. Zawislak, Chair, reported on test methods E 28, "Test Method for Softening by Ring-and-Ball Apparatus" and the Cup & Ball (Mettler) methods. She reported that the revised draft of the Ring & Ball method had passed the D-1 ballot with no negative votes and will be published as a 1996 standard. The various comments received during the balloting were discussed and it was agreed to revise the text to state that the results be reported to the nearest whole number rather than to the nearest 0.5°C. The test, or possibly only the affected portion, will be submitted for inclusion in the next D-1 ballot. With regard to the Cup & Ball method (Mettler), the chair reported that one negative vote had been received during the D01.34 ballot. The negative vote recommended that the results be reported to the nearest 0.5°C rather than the nearest 0.1°C. The negative vote was discussed and voted upon, and unanimously found to be persuasive. After discussion, it was concluded that the results should be reported to the nearest degree, the same as the Ring and Ball method. Other comments received during the balloting were discussed. The approved ones will be incorporated into the text of the method and the new text submitted for a concurrent D01.34/D-1 ballot.

D01.34.06—Color Measurement of Rosin and Fatty Acids—W. Mark, Chair, reported on the status of this project indicating that the round-robin had been completed and the text revised. The round-robin results confirmed earlier

expectations that the precision of all three instruments used in the round-robin gave far better precision than the Gardner color disc method. The results confirmed that, with these instruments, it should be realistic to report results to the nearest 0.1 Gardner unit. He then reviewed the latest draft of the text of the instrumental method. This text had been distributed with the agenda. In the discussion, a number of changes were suggested and agreed to. It was agreed that the color coordinates listed in D 1544 would also be included in the new standard. The changes will be incorporated into the text, the precision and bias statement developed and the method submitted for a D01.34 ballot before the end of 1996.

D01.34.07—Capillary GC of Turpentine—W. Trainor, Chair, presented his outline of this new method and distributed copies of the type of GC printout that is now possible using capillary column GC. Mr. Trainor will prepare a draft method for discussion at the October meeting. A concern was the need for more participation by turpentine fractionators. Two major fractionators, Glidco Organics and BBA, are not represented on D01.34. J. Russell will work with the chair to obtain input from these companies.

D01.34—J. Russell, Chair, arranged a joint session with members of ISO/TC 35. At this session J. Paap, Secretary of ISO/TC 35, outlined the structure and operating procedures of ISO/TC 35. Discussion then centered on the elimination of technical differences between selected ASTM and ISO test methods. Specifically with regard to ISO 8623 "Specifications for Tall Oil Fatty Acids," Chair Russell will write to the Secretary of ISO/TC 35/SC 10, B. Reinmüller, proposing that the iodine value in that specification should be reduced from a 150 minimum to a 125 minimum. Such a change would enable U. S. tall oil fatty acids to meet the ISO specification. Further, the stewards of the ASTM standard methods for characterizing tall oil fatty acids will review the corresponding ISO standard methods and recommend how the methods can be technically harmonized. Similarly the ISO experts will examine these same standards and make appropriate recommendations. D01.34 recommendations will be discussed at the October meeting and then forwarded to Mr. Reinmüller for comment. In other studies, Chair Russell reported that it had been suggested that D01.34 take on the responsibility for three test methods that are currently the responsibility of two relative inactive subcommittees, D01.32 and D01.33. After discussion, it was unanimously agreed that D01.34

would be willing to accept the responsibility for D 1984 "Specifications for Tall Oil Fatty Acids." Decisions regarding D 1469, "Test Method for Total Rosin Acid Content of Coating Vehicles," and D 1542, "Test Method for Qualitative Detection of Rosin in Varnishes," were deferred.

Subcommittee D01.35 Solvents, Plasticizers, & Chemical Intermediates R. G. Montemayor, Chair

D01.35.10—Hydrocarbon Solvents and Ketones—S.A. Yuhas and R.L. Hinrichs, Co-Chairs. This task group is up to date and on schedule with the review/reapproval of the 24 Standards for which it is responsible. None of the standards of this task group received any negatives in any of the ballots. A draft of the wordings for a revision of D 3257 "Total Aromatics in Hydrocarbon Solvents by GC" to address a previous negative will be reviewed by R. G. Montemayor. The new revision will be balloted at the D01.35 level. The first draft of a method for Trace Benzene in Hydrocarbon Solvents by Capillary GC was discussed. The draft was received favorably and some editorial comments and minor technical modifications to clarify GC parameters were suggested. R. G. Montemayor will redraft the test method incorporating the suggestions the method will be balloted at the subcommittee level. Development of a specification for D-limonene was discussed. I.S. Rhee suggested contacting the limonene suppliers listed in his PD680 report. The Federal Specification AA3007 for VM&P type thinners was discussed. This specification has some requirements beyond D 3735, but is not in conflict with the ASTM standard. The proposed AA3007 requires a flash point above 50° F and a maximum aromatic content of 1%. D 3735 "Specification for VM&P Naphthas" will be revised to include a Type IV which requires an aromatic content of <2%. In addition, the maximum aromatic content of Types I and II will be reduced from 33 to 20%.

D01.35.20—Reactive Monomers—J.D. Frugé, Chair, said there are no standards under the responsibility of this task group that are overdue. No negatives were received in any of the balloted items for this task group. Several comments were received regarding D 3845, "Specification for Glacial Methacrylic Acid," D 3451, "Specification for 2-Ethyl Hexyl Acetate," and D 3547, "Specification for n-Butyl Acrylate." They were all discussed and taken into consideration. R. G. Montemayor reviewed D 1078, "Distillation Range of Volatile Organic Solvents." He suggested a correction to

Table 4 and rounding the precision data to one decimal place. The revision with the suggested corrections will be balloted at the subcommittee level. J. Morrison presented some data to address the comments from P. Bernard, of Quantum Chemicals, regarding D 2088, "Acidity in Vinyl Acetate." The results presented indicated that the use of bromothymol blue as an indicator and the use of 0.02 N NaOH presented equivalent results. However, the use of various solvents indicated a need for further study. The method will be revised accordingly.

D01.35.30—Chemical Intermediates—J. Morrison, Chair, reported all standards under the responsibility of this task group are up-to-date and on schedule for review. No negatives were received in any of the balloted items for this task group.

No progress on the GC method for determining the formic acid content of glacial acetic acid as submitted by J.D. Frugé at the June 1995 meeting as R.J. Bartram was unable to attend this meeting. R.G. Montemayor will follow-up on this method.

D01.35.40—Plasticizers and Ester Solvents—J. E. Lawniczak, Chair, said all standards are up-to-date and on schedule for review. No negatives were received on any of the balloted items for this task group. A comment was received from M. Grossey regarding the reference to the safety caveat on the proposed revision on the inhaling solvent fume. The task group did not think that this was necessary. Z. Murphy's comment on D 608 was deemed to be persuasive enough and a caveat similar to D 268 will be incorporated in the next revision. J. Reid's comment on D 1296 suggesting the same language as in D 268 as it pertains to odor testing will be considered in the next revision of the standard. Suggested changes to D 1209 "Pt-Cobalt Color of Clear Liquids" were discussed. The standard will be balloted at the D01.35 level. The revision will result in separate precision statements for samples with Pt-Co Color <25 and for samples with Pt-Co Color of <25. D 3131, "Specification of Isopropyl Acetate" was reviewed by J. Morrison. He suggested that the distillation range requirement should be made optional because the GC purity requires that equivalent purity information is provided. This revision will be submitted for D01.35 ballot.

D01.35.50—Coordination—L. Forrest, Chair. D 1310 "Flash Point and Fire Points by TAG Open Cup Apparatus" received several negatives on the ballot for its withdrawal with no replacement. The negatives were considered persuasive and this standard will be reballoted

for reapproval with no change. D 86 is being completely rewritten as a fully metric standard. It will be balloted at the subcommittee level. For the various flash point standards, verification fluid limits for four pure hydrocarbons are being discussed and incorporated in future revisions of the methods. A number of D 16 standards were balloted with the addition of E 29 for significant digits in the referenced documents section. Among these are: D 847 and D 2935. A new external standard GC method D 5917 was developed for trace impurities in aromatic hydrocarbons. This is an alternative method to D 2360.

D01.35.60—Method Development—Due to changes in his responsibility at Supelco U.S.A., R. J. Bartram has resigned as Chair of this task group. R. G. Montemayor presided over the task group meeting. A number of GC methods are under development. Updates on the status of the GC method will be followed up by R. G. Montemayor and a report will be made at the January meeting. Among the methods under development are: (1) GC method for the analysis of MAK and MIAK; (2) GC method for the analysis of formic acid in acetic acid; and (3) GC method for the analysis of acrylate esters.

D01.35 welcomed two new members, M. N. Grossey and J. P. Hepp. Due to changes in his company responsibilities, R. J. Bartram resigned as Secretary of D01.35 and as Chair of D01.35.60 Task Group on Method Development. The subcommittee is soliciting the interest of any member to become Secretary of D01.35 or Chair of D01.35.60. D01.35 is up-to-date and on schedule with the review/reapproval process of all the 94 standards under its jurisdiction.

Subcommittee D01.36 Cellulose and Cellulose Derivatives

G. Y. Moore, Chair

Methods D 1795, "Test Method for Intrinsic Viscosity of Cellulose" and D 1695 "Terminology of Cellulose and Cellulose Derivatives" have been submitted on the D-1 (96-03) ballot concurrently with D01.36 after revisions. New methods D 5896-96, "Test method for Carbohydrate Distribution of Cellulosic Materials," and D 5897-96, "Determination of Percent Hydroxyl on Cellulose Esters by Potentiometric Titration-Alternative Method," have been published and will appear in the 1997 *ASTM Book of Standards*.

J. Morton is finishing a new method entitled, "Test Method for Cuprammonium Viscosity of Cellulose by the Ball Drop Method," which will be sub-

mitted for committee mail ballot this fall.

Methods D 817, "Methods of Testing Cellulose Acetate Propionate and Cellulose Acetate Butyrate" and D 871, "Method of Testing Cellulose Acetate" will be submitted for D-1 (96-03) mail ballot by J. de Wit. Both methods will be edited to reflect that new alternative test methods are available for several of the tests within these methods.

D01.36 reviewed the stewardship list and assigned stewards for all the test methods. It also discussed interactions with other standards organizations such as TAPPI and USP. G. Moore indicated he wanted to be the liaison between D01.36 and USP, and J. Morton may do the same with TAPPI.

Subcommittee D01.37 Ink Vehicles

A. N. Scarlatti, Chair

D01.37.01—Resin Solutions—A.N. Scarlatti, Chair, reported no further action is required on this method since the method passed D-1 ballot and all editorial changes have been made. The method will be published as D 5958, "Practices for Preparation of Oil-Based Ink Resin Solutions."

D01.37.06—Pigment Dispersability—M. Fuchs, Chair, said the current draft of the practice was reviewed by the task group. The scope of the practice will be broadened to encompass a general evaluation of vehicles for pigment wetting using a flushing process. Suggested changes will be incorporated into a new draft which will be reviewed at the next D01.37 meeting.

D01.37.07—Resin/Solvent Compatibility—P.D. Frisch, Chair, said the method, entitled "Method for Determining the Compatibility of Resin/Solvent Mixtures by Precipitation Method," passed subcommittee ballot with several optional comments. These comments were discussed and those thought substantive will be incorporated into a revised draft which will be submitted for a D01.37/D-1 ballot.

This method describes a manual procedure for determining precipitation temperature. Since automated test equipment is now available and widely used in Europe, the subcommittee felt that, if sufficient members of test units were available in the U.S., a method should be developed. P.S. Zawislak agreed to get a copy of the European method for subcommittee review at the next meeting.

D01.37.08—New Membership—P.D. Frisch, Chair. Attendance remains strong with nine members and six visitors in attendance. Two members of the inter-

national ink community participated in the meetings.

D01.37.09—Alkyd Compatibility—J. Zerkel, Chair. A second draft of the proposed "Test Method for the Determination of Alkyd Compatibility of Ink Resins by the Direct Cut Method" was reviewed. Revisions agreed on by D01.37 will be incorporated into a new draft which will be mailed to D01.37 members for comments prior to the next meeting.

D01.37—Ink Vehicles—A. N. Scarlatti, Chair. In A. Scarlatti's absence, J. Daugherty served as Chair. Two standards were up for review. D 5062-90, "Test Method for Resin Solution Dilutability" was balloted and received two negative notes. E. Casserly withdrew his negative subject to minor editorial changes and P. Guevin withdrew his negative subject to the addition of a bias statement. A statement will be included that no information can be presented on the bias of the procedure because no material having an accepted reference standard.

D 5166-91, "Practice for the Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven," received one negative vote from A. Scarlatti. This negative was considered non-persuasive since Committee on Standards (COS) directives do not allow inclusion of commercial sources when there are more than one.

D01.37—There was considerable discussion of the recent COS decision to disallow references to sources of supply when there is more than one. D. Aynessazian agreed to draft a letter to the COS on behalf of D01.37 and D01.56 expressing our disagreement with the policy and stating our position on the issue.

Subcommittee D01.38 Hydrocarbon Resins

A. Kravetz, Chair

D01.38.01—Terminology—J. Silcox, Chair, submitted a draft list of terms and definitions for editing by D01.38 members.

D01.38.02—Softening Point—P. S. Zawislak, Chair, asked members to send her proposed wording for a softening point method for hydrocarbon resins. It was agreed that the automatic ring and ball method will be the referee method for hydrocarbon resins. The Mettler softening point method will also be studied.

D01.38.03—Color—R. Allen, Chair, asked for discussion of the types of color scales appropriate for hydrocarbon resins. It was agreed that for resins with

solution colors below Gardner 2, an instrumental method with a defined zero is needed. Yellowness index, and instrumental equivalents of Saybolt color and Pt/Co color were discussed.

D01.38.04—Cloud Point/Compatibility—It was moved and passed that this task group be renamed "Solubility." The subcommittee favors the use of an instrumental method to determine cloud point, as a surrogate for the determination of compatibility.

D01.38.05—Viscosity—P.S. Zawislak, Chair, noted that a standardized Brookfield therosmet melt viscosity method is needed.

D01.38—A. Kravetz, Chair, reported the 14 names and company affiliations of D01.38 members. It was moved and passed that task groups "Stability" and "New Instrumental Test Methods" be formed. W. Trainor will be the gathering point for suggested new test methods. A. Kravetz reported on efforts and plans to publicize D01.38. P. S. Zawislak will determine which ISO groups have scopes similar to that of D01.38.

DIVISION 40 PAINT PRODUCTS APPLIED ON SITE

Subcommittee D01.42 Architectural Finishes C.W. Vanderslice, Chair

D01.42.03—Porosity of Paint Films—C. C. Tatman, Chair. The meeting was chaired by C. W. Vanderslice in the of Chair C. C. Tatman. Draft No. 3 of the proposed test method, incorporating suggested revisions from the previous draft, was reviewed and critiqued. Most of the revisions were found acceptable. It was suggested that the definition of "porosity" in the "Summary of the Test Method" be set forth in a separate section under "Terminology" as directed by the *Form and Style for ASTM Standards* manual. Previous concerns were raised again about judging the "end-point" in wiping excess mineral oil from the surface of the test paint. The question was raised as to whether a small "squeegee" might function to reduce possible error in this step. A question about the final units resulting from the equation to calculate porosity were noted in the calculations section and need to be addressed to insure correctness. Once these and several other minor editorial changes are resolved by the chair, it is recommended that the draft be submitted for subcommittee ballot.

D01.42.04—Wet Adhesion of Latex Paints—L. Mullen, Chair, reviewed the task group's progress at defining a test method using a scrub machine to measure early and mature wet adhesion. The proposed method involves the application of a test paint and a control paint to a cured industrial alkyd panel. The panel is then submerged in water and the latex paints are cut in a crosshatch pattern. The panel is then placed on the scrub machine and the degree of failure is monitored at intervals during the test and at 1,000 cycles. The procedure for the proposed round-robin was discussed. The definition of early wet adhesion will be determined prior to the round-robin. The round-robin will be run using three egg-shell and three semi-gloss paints of varying levels of wet adhesion on two gloss alkyd substrates. Nine cooperators have volunteered to participate in the round-robin.

D01.42.05—Adhesion of Latex Paints to Chalky Surfaces—A. A. Leman, Chair, distributed copies of the letters and report forms that were sent to the round-robin cooperators recently. This document was reviewed by the meeting attendees. Also distributed was the latest draft of the test method. The chair commented on the expected difficulty of having a commercially available "standard substrate" to be included in the test method. The task group agreed not to proceed with describing a "standard substrate" for use in the test method. Instead, the description of both the "standard" and "alternate" substrate will be combined into a single definition of a chalky substrate to be used for the test method. The task group recommended, however, to include an example of a paint formulation that can be weathered to a chalky surface for use as a chalky substrate for testing. The chair agreed to continue to include this formulation as a reference along with a description of the key formulation ingredients that produce fast development of a chalky surface. For the next meeting, the chair expects to have concluded the round-robin evaluation which will allow for inclusion of the repeatability and reproducibility statements, along with precision and bias comments. Additionally, the chair will reunite the draft method according to the ASTM forms guide so as to have the document ready for letter ballot at the next meeting.

D01.42.20—Water Repellency of Wood—V. Scarborough, Chair, distributed copies of the current method D4446 for discussion. The current method specifies testing specimens at 80°F and 65% RH. The group will run a round-robin in which wafers are tested at the specified temperature and humidity and at stan-

dard conditions of 73.5°F and 50% RH in order to determine how sensitive the method is to this variation. It is desired by those who use the method to determine the need for the higher temperature and humidity conditions. The chair passed out testing specimens treated with 5% paraffinic wax in mineral spirits and their end-matched controls. Six cooperators will run the method under the two temperature and humidity conditions and the results will be discussed at the next meeting.

D01.42.22—Guides for Testing Architectural Coatings—H. E. Ashton, Chair, briefly reviewed the minutes of the last meeting to provide the agenda. As previously agreed, the revision of D 1546-62 that had attained general consensus had been submitted to D-1 ballot. Five voters plus the chair had submitted comments on one typing mistake and the number reversal on the ballot form. The other point raised by the Chair was whether visual comparison applies to change in adhesion and suggested that "subjectively" might be more appropriate. Seeing that no support was offered to the latter, 6.4 remained as balloted. A marked copy of the practice will be prepared for society review. The names of those co-opted to the ad hoc group to review the points on which consensus had not yet been reached were reported. The chair will provide them with a summary of the previous proposals on which D01.42.22 needs advice from those familiar with this type of product. The diagram from A. Z. Leathers to clarify the arrangement for coating panels with sealer and finishing materials will also be included in the next revision. It was reported that T. J. Sliva had received a request from D01.42 chair that he, as steward of D 4540, should review the practice for reapproval. T. J. Sliva was advised by D01.42.22 chair that D 4540 was one of two latex coating practices that had not been withdrawn when Guide D 5324 was first published because they had just been revised (January 1993 minutes). Consequently, both D 4540 and D 3129 should now be balloted for withdrawal and replacement by D 5324. The chair reported that the results of D01.42 (94-05) and (94-06) ballots, with closing dates of January 30 and 31, 1995, were still missing. The five items covered revisions to D 3730, D 5146, and D 5324 to make them more consistent, where applicable. D01.42 chair said he would continue his search. The last item discussed was the revision of D 1641, Test for Exterior Durability of Varnishes. The points raised on previous votes against reapproval were reviewed and the chair will prepare a draft for D01.42 ballot.

D01.42.25—Scrub Resistance of Paints—T. J. Sliva, Chair, reported that the proposed revision of D 2486 under ballot to expand the use of the method beyond interior latex flat wall paints and to give guidance on conditioning and “breaking-in” of test brushes is proceeding. Methods D 3450, D 4213, and D 4828 will be reviewed for commonality in description of apparatus and submitted for revision, if needed. An outline of a proposed revision to D 2486 to incorporate the use of multiple drawdowns on a single chart (test paint and control paint) was distributed. Five cooperators have agreed to review the document. It was the decision of the task group to eliminate any references to calibration charts and specify drawing down both paints in one application. Upon receipt of comments from the various cooperators, the chair will prepare Draft No. 1 on the proposed revision to D 2486 for distribution at the January meeting. The chair distributed copies of the results from three cooperators on the round-robin testing of scrub resistance using the new procedure. Results from an additional four cooperators will be available by the January meeting.

D01.42.28—Paint and Coatings Removers—V. Scarborough, Chair. The group discussed two negatives received from D01.42 ballot. The first negative involved the testing of paint removal on metal because the voter felt that paint removers would not cause rusting and pitting on this substrate. The group voted unanimously to find this negative not persuasive since the use of water-based paint removers on metal can cause rusting and pitting. The second negative recommended the scoring scale be revised such that 100% removal be equivalent to complete failure. The group voted unanimously to find the negative not persuasive because the object of paint removers is to remove paint and when 100% removal is achieved, this is considered to be completely satisfactory. Comments were also received from H. Ashton regarding the precision and bias statement. He feels that because so few labs participated in the round-robin and the precision of the method is poor, the rating scale should be revised to a scale of 0 to 5 from a 0 to 10 scale. This would require that the method go through another round-robin. However, the chair explained that the great expense of panel preparation and lack of cooperators would make the likelihood of another round-robin extremely low. Thus, the group decided to turn the method into a practice. After review of the document once more, several changes were made to rank performance rather than rate the paint removers tested and references to precision and bias were removed. The

practice will be rebalotted and the results will be reviewed at the next meeting.

D01.42.29—Guide to Testing Exterior Wood Stains—A. Leathers, Chair. The minutes from January 1996, were read and approved. Modifications to the agenda were approved. Status of the D-16 ballot on definitions was still unavailable. Revision 1 of the guide was distributed. The idea to have two separate guides, one for semitransparent stains and one for solid color stains, was discussed and rejected. Subsections of the guide will distinguish between stain types as appropriate. Two tannin stain resistance test methods were received and will be reviewed during the January 1997 meeting. Each section of revision 1 of the guide was discussed. A section on water repellency will be added by the chair. Other amendments and corrections were noted and will be incorporated into Revision 2. Revision 2 will be distributed during or prior to the January 1997 meeting.

D01.42.30—Wet Edge Time of Latex Paints—J. Cogar, Chair. The scope of the method was determined to be “to determine the length of time a coating remains ‘wet’ or ‘open’ enough to allow for brush-in at the lap edge.” Parameters including substrate, means of initial application, type of test, timing, and rating were discussed. It was agreed that the procedure will be such that a paint is applied, then brushed in perpendicular sections at constant time intervals, into the original painted area. Ratings will focus on the edge of the first coat becoming visible. Work will be done to narrow down substrate choices and to compare applying the initial paint by drawdown versus brushing. An initial draft of the procedure will be prepared for the January meeting.

D01.42.32—Whole Paint Specifications—T. Race, Chair, invited the 21 members and three visitors present to introduce themselves by identifying their company and commenting on their position on the proposed draft specifications for interior latex paints. Most of the attendees stated that they were either neutral or opposed to the creation of whole paint specifications. Opposition was particularly significant among the producers present. D01.42.32 chair reminded meeting attendees of the results of the D01.42 member survey that signaled an interest in developing a specification for an interior flat latex paint. Attendees discussed the pros and cons of whole paint specifications for architectural finishes alternatives, such as a guide to specifying, were proposed and discussed. Opposition to developing specifications was significant. A

guide to specifying was not determined to be beneficial. No conclusions were made on the future direction of D01.42.32.

D01.42.33—Scrub Resistance by Weight Loss—L. Schaeffer, Chair. The meeting was chaired by H. E. Ashton in the absence of Chair L. Schaeffer. On D-1 LB 96-01, the revision to D 4213 received a negative vote because it was claimed that the improvement from using calibration panels was not sufficient to justify the additional work and cost. The negative was withdrawn subject to the reason for it being discussed. The resulting discussion was indeed vigorous. The chair pro-tem reported that L. Schaeffer had asked him to recalculate the precision of D 2486 on the basis of the 95% confidence level instead of the more lax 90% confidence. His reason was that showing the calibration procedures not only resulted in better precision over the previous D 4213 version, but also that it would be much better than D 2486. However, consultation with R. K. Morrison of D01.20 would be necessary before this could be carried out. Editorial changes proposed on an affirmative vote were made on the balloted item, which would then proceed to society review (formerly “ballot”). The final conclusion was to revise the Significance and Use section by adding a sentence indicating that use of calibration panels is most relevant for interlaboratory comparisons. Since this is a technical change, the proposed revision will be submitted to the group and subcommittee chairs for their consideration and, if approved, for balloting. Finally, the group was of the opinion that the four methods, D 2486, D 3450, D 4213, and D 4828, should be assigned to two D01.42.25 and D01.42.33 on the basis of washability versus cleanability.

D01.42.35—Cleanability of Latex Paints—D. Anton, Chair, presented a new proposed test method for measuring the rate of cleaning of flat latex points. By measuring several data points during the early cleaning cycles, the method attempts to distinguish true surface cleanability from artifacts caused by surface irregularities. The test method is not developed enough yet to initiate round-robin testing. It was requested that the chair bring data and panels to the next meeting to clearly demonstrate the differences between this method and D 3450 and D 4828. It was also requested that the chair look at the applicability of the proposed method to arrange of hydrophobic and hydrophilic stains, and a wider range of paint glosses.

D01.42—Architectural Finishes—C.W. Vanderslice, Chair. The minutes of the last meeting were approved as written. The chair discussed the name and scope

change that he will be proposing to D-1. The purpose of the changes is to align D01.42's name and scope with other ASTM subcommittees using similar grammar and descriptions. No opposition was voiced toward the proposed name and scope, as read by the chair. The chair reported that D01.42 membership now stands at 26 producers, 4 users, 34 general interest, and 9 unclassified, for a total of 73 members. This represents a net change of -4 from last year. Of the 73 members, there are 49 voters and 24 non-voters. A moment of silence was observed for Joseph Bennett, who recently passed away. Resignations were received by E. B. Countryman and J. Price. A negative was submitted by H. E. Ashton for the withdrawal of D 1736. He questioned why this standard is being withdrawn without another standard available to take its place. The resulting discussion centered around the fact that efflorescence is no longer an issue with interior paints. The vote to continue the withdrawal of D 1736 resulted in 20 affirmations, 0 opposed, and 1 abstention. A. Cohn's abstention with comment on D 4213 was discussed. D 2486 passed society ballot but will incorporate some changes discussed at the task group meeting. He explained that the following overdue standards were reappraised: D 1641-59/87 and D 1849-80/87. D 1736-89 will be withdrawn if supported by D-1. The task group reports were read, with the exception of two task group meetings that were canceled. A question was raised by F. Burns regarding headquarter's directive to remove references to specific equipment vendors from standards. The chair clarified by reading the 10th edition which states that a reference can be made only if one source exists. Most attendees were still opposed to this. The chair will write an appeal to the Committee on Standards on behalf of D01.42 subcommittee members. The chair reminded attendees that membership can be revoked upon failure to vote on three successive D-1 ballots.

Subcommittee D01.46 Industrial Protective Coatings G.W. Gardner, Chair

D01.46.02—Surface Preparation—G. W. Gardner reported that the round-robin on D 4940, "Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives," using portable meters was completed. W. C. Johnson's written report provided the task group with detailed results on the round-robin.

The lab pooled variance of 64% and between laboratory variance of 88% is much greater than what the task group believes it should be based on individual

experience. Johnson recommends performing another round-robin using a single batch of slurry filtrate that he will prepare and send to the participants along with a portable conductivity meter. D. Griffin, R. Schwab, S. Boocock, J. Fletcher, W. Johnson and G. Gardner volunteered to participate in this next round-robin.

W. Johnson reported the correlation coefficient between the pocket meter and null point meter as 0.96. More detailed information on correlation coefficient will be generated by the task group. S. Boocock has considerable data on use of the portable conductivity meter. He will coordinate with Johnson to provide the detailed information needed for the research report.

The units used for D 4940 (mmho/cm) is different than those used in ISO 11127-6 (millisiemens/metre). S. Boocock will draft a statement to allow conversion from one unit to the other. Consideration will be given to adding a second procedure to D 4940 that uses weight mixtures of abrasive and water (currently volume mixtures are used). Another possibility is to work out a conversion method that takes into account the different densities of the abrasives, thereby allowing the volume method to be used to calculate what results would be obtained from the weight method.

The task group will not make any changes to D 4940 until the next round-robin is complete and correlation coefficient is documented.

The USTAG ISO/TC 35/SC 12 will recommend the ASTM D 4417 "Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel" Method C tape test as a new request item at the October 1996 SC 12 meeting.

T. Langill is working on separating D 2092, "Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting," into two or three separate guides. He plans to have a draft on the general galvanizing ready in August 1996. He needs technical contacts for sheet galvanizing.

D01.46.03—Repainting—G. W. Gardner, Chair, reported that D. Griffin and the Houston Society for Coatings Technology had run a round-robin on D 4752 "Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub" during the Houston Society's Show in April 1996. A zinc-rich primer was evaluated at two different thicknesses for MEK resistance at two different cure times. The results from this round-robin should be useful in generating information about the repeatability and reproducibility of the test method. However since there is no standard or reference material for comparison, bias cannot be determined.

Precision cannot be determined since ASTM does not have an approved statistical technique to determine precision of test methods involving ratings, rankings, categorization, and pass/fail assessment. G.W. Gardner will contact R. Morrison (chair of D01.20 on Quality Assurance and Statistics) to determine the best way to include this round-robin information in D 4752 and to get a program going within ASTM to set up a task force to develop a statistical approach for determining precision on this type of data. (Prof. Neil Ullman, Vice-Chair of E-11, has recommended this course of action.) One possible approach for D 4752 is to place the round-robin results in an appendix. These results would include the actual hard data and scatter plots of the data for the four different conditions: thin film six hour cure, thin film 24 hour cure, thick film six hour cure and thick film 24 hour cure. G.W. Gardner recognized and thanked Mr. Griffin, M. Dykstra, D. Old, and B. Mysza for participating in this study.

A. F. Rutkiewicz presented three photographs representing rust grades 5, 6, and 7 for consideration as pictorial standards for D 610 "Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces." These photographs were made starting from a panel that experts agreed was a rust grade of 6. A. F. Rutkiewicz used computer enhancement to generate photographs of rust grades 5 and 7. These rust grades look like actual, real world rusting and they do agree with the percentage of rusted area indicated by the various rust grades (5 = 3%, 6 = 1%, and 7 = 0.3%). A. F. Rutkiewicz will produce computer enhanced photographs for the remaining rust grades of 1, 2, 3, 4, 8, and 9. He will also produce photographs representing higher and lower dispersities of rust for each of the rust grades. S. Boocock will provide direction to A.F. Rutkiewicz on degree of dispersity. Grayscale versions of these photographs will appear in D 610.

D01.46.07—Inspection—G.W. Gardner reported that the new "Guide for Painting Inspectors (Concrete and Masonry Substrates)" received two negatives on the D01 (96-01) ballot. The D.K. Griffin negative included many changes to the document. Most changes were considered editorial and Griffin withdrew the negative with the editorial changes made. However, since the changes were extensive, the guide will be re-balloted. The C.G. Grimm negative recommended including two references in Section 1.1. These references are more engineering and design related and are outside the scope for a painting inspectors guide. The task group unanimously found the Grimm negative not persuasive.

D 3276 "Guide for Painting Inspectors (Metal Substrates)" received three negatives on the D01 (96-01) ballot. The D.M. Berger negative suggested adding many references to D 3276. The task group unanimously found Berger not persuasive because the references he wanted added were concerned with evaluation of existing coatings, tests performed in the laboratory, concrete related, safety or environmental protection related or contractor qualification related. All of these are outside the scope of painting inspectors. The Griffin negative included many changes to the document that were considered editorial. Mr. Griffin withdrew his negative with the editorial changes. However, since the changes were extensive, the guide will be re-balloted. The H.S. Stoner negative suggested that Section 10.2.6 on Holiday Detectors should have similar wording to the concrete guide. The task group agreed that similar wording is important and that we have been working diligently to have both guides have similar wording. However, since concrete and metal require different methods of holiday detection the wording must be different. The task group unanimously found H.S. Stoner not persuasive. Comments from D.J. Beamish and G.A. Wayenberg will be considered in the next ballot.

D01.46.12—Sampling—L. Smith has drafted a new "Practice for Sampling of Coating Films." The task group reviewed this draft and suggested several changes.

D01.46.13—Guide for Testing—J. Cheng, Chair, reviewed Draft #4 of the new "Guide for Testing Industrial Protective Coatings." Several changes were made. Considerable discussion occurred on which tests to include. The basic question is: should all tests that could be used be included or should only those that the task group thought most relevant be included? The general opinion seemed to be to include all tests, but to provide commentary on those that seemed less relevant and less meaningful.

S.K. Boocock will write a draft on section 7.15 "Analysis of Paint" and Section 7.16 "Transfer Efficiency." G. Gardner will review section 8 "Application and Film Formation" and provide a draft for section 8.7 "Pot Life" and 8.8 "Recoat Time." Test methods on immersion, chemical spot testing, and slip resistance need to be added. Commentary on flame spread, cathodic delamination, coefficient of friction, dielectric strength, and resistance to chemicals needs to be added.

D01.46.14—Chemical Immersion—S. Boocock, Chair, reviewed modifications to Draft #2 of the new "Test Method for

Immersion Resistance of Industrial Protective Linings" provided by D. Griffin and S. Boocock. These drafts would actually produce three different test methods: (1) immersion, (2) immersion with a temperature gradient, and (3) immersion under high temperature and high pressure. The task group decided to put these three tests under one test method and separate into Method A, Method B, and Method C. S. Boocock will prepare a Draft #3 and send out for review prior to the January 1997 meeting.

ISO has two methods that should be considered in the task group: (1) ISO 2812-1 "Paints and Varnishes—Determination of Resistance to Liquids—General Method," (2) ISO 2812-2 "Paints and Varnishes—Determination of Resistance to Liquids—Water Immersion Method."

D01.46—G. W. Gardner, Chair, welcomed four new members to D01.46: Thomas B. Dedmon, of Saudi Basic Industries Corp., in Riyadh, Saudi Arabia; Donald D. May, of DuPont in Deepwater, NJ; Timothy D. Race, of US Army CERL in Champaign, IL; and Robert V. Stachnik, of Testex in Glenn Dale, MD.

D01.46 has 82 members (54 official voting and 28 unofficial voting). Updates from each task group can be found in the preceding minutes. C.T. Grimm voted negative on D-1 ballot (96-01) item 75 the new "Guide for Painting Inspectors (Concrete and Masonry Substrates)." D01.46 upheld the task group's recommendation to find C.T. Grimm not persuasive. D.M. Berger and H.R. Stoner voted negative on D-1 ballot (96-01) item 76 D 3276, "Guide for Painting Inspectors (Metal Substrates)." D01.46 upheld the task group's recommendation to find D.M. Berger and H.R. Stoner not persuasive.

The D-1 ballot (96-01) item 77 to withdraw D 5043, "Test Method for Field Identification of Coatings," received negatives from H. Fujimoto and H.R. Stoner. H.R. Stoner has volunteered to help update this test method. D01.46 found H. Fujimoto and H.R. Stoner persuasive and D 5043 will not be withdrawn. D 5043 must pass D-1 ballot by the end of 1998 or it will not be published in 1999.

D01.46—D01.46 is seeking volunteers to chair task groups on surface preparation and condition assessment. Interested parties should contact G.W. Gardner.

D01.46 has thirteen standards. Standards for these standards are: D 610, G. Gardner; D 2092, S. Boocock; D 2200, S. Boocock; D 3276, L. Smith; D 4417, G. Gardner; D 4541, M. E. McKnight; D 4752, D. Griffin; D 4940, W. Johnson; D 5043, M. E. McKnight; D 5064, G. Gardner; D 5065, M. E. McKnight; D

5402, G. Gardner; and D 5702, L. Smith. D01.46 will consider forming a task group to write a test method on graffiti resistance. Anyone interested in working on this test method should contact G.W. Gardner.

Subcommittee D01.47 Masonry Treatments E. McGettigan, Chair

D01.47.01—Water Repellency of Treated Masonry—V. Scarborough, Chair, distributed a revised draft of the method "Evaluating Clear Water Repellents on Masonry Units." This draft incorporated the use of 3 in. x 6 in. x $\frac{1}{2}$ in. masonry panels (D 1734) as the test substrate. The round-robin test studies in the past did not show good correlation between labs. A proposed cause was the possible microcracking of the 2-in. cubes during the 110°C drying cycle. It is hoped that this panel size will not be subject to possible microcracking. The group suggested several changes to the method including a better description of how the panels are to be coated with the water repellent. The chair distributed a set of three panels to each cooperator. E. McGettigan will supply a test product for evaluation. The five cooperators will run a round-robin test study, and the results will be presented at the next meeting for discussion.

D01.47.05 Water Vapor Transmission of Treated Masonry Substrate—E. McGettigan, temporary Chair, reviewed the results using a modified E 96 procedure. The test substrates used in this round-robin study were D 1734 masonry test panels. An acrylic coating was tested at three different concentrations (5, 10, and 20%). The results indicate that this procedure may be a viable method for determining the water vapor transmission of water repellent treatments. Items to be investigated before the first round-robin can begin are: (1) locating a standard cup to hold the water and specimen, (2) sealing material that will be compatible with the various water repellent technologies, and (3) treatment of the substrate. The information gathered will be reported at the next meeting.

D01.47.10—Evaluation of Field Applied Treatments—E. McGettigan, Chair, presented the round-robin results of Draft #4 of the "Proposed Test Method for Determining the Water Absorption of Hardened Concrete Treated with a Water Repellent." The results from the three labs indicate the method has good inter- and intra-lab reproducibility. The addition of a procedure to verify the effectiveness of the sealing material used to seal the untreated sides of the specimens

will be added to the method. A fifth draft of the method will be mailed to D01.47 members for comments.

D01.47.11—Research and Planning—E. McGettigan, Chair, initiated a discussion of membership and participation. Over the last few years the members participating at the biannual meetings have dwindled. A brainstorming session was conducted to generate ideas for a membership drive and ways to generate interest in new method development for masonry treatments. The following ideas were generated and will act upon before the next meeting. (1) A letter will be sent to SWRI members and companies that displayed water repellent products at the World of Concrete Show. The letter will describe the activities of D01.47 for Masonry Treatments that will include: recently published standards, standards up for renewal, and task group work. We hope to contact the producers, users, general interest and specifiers via this approach. (2) A letter will be sent to all State DOT (Department of Transportation) Research Groups with the new Freeze-Thaw method, D 5860. In addition, the letter will contain all information described in Idea 1. We hope to contact end users and specifiers with this approach. (3) A publicity request will be submitted to introduce new Test Method D 5860 in publications, such as "The Construction Specifier," "SWRI" and Aberdeen Group Publications.

Subcommittee D01.48 Pipeline Coatings R. W. Geary, Chair

D01.48—R. W. Geary will try to coordinate the meeting time in January 1997 with AWWA.

All test methods for re-approval, G 8, "Test Methods for Cathodic Disbonding of Pipeline Coatings," G 10, "Test Method for Specific Bendability of Pipeline Coatings," G 11, "Test Method for Effects of Outdoor Weathering on Pipeline Coatings," G 13, "Test Method for Impact Resistance of Pipeline Coatings (Limestone Drop Test)," G 14, "Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)," G 19, "Test Method for Cathodic Disbonding of Pipeline Coatings," G 20, "Test Method for Chemical Resistance of Pipeline Coatings," and G 42, "Test Method for Cathodic Disbonding of Pipeline Coatings Subjected to Elevated Temperatures," were approved. This included an editorial change in Test Method G 8 which will be included in the next publication. Keywords were added (an editorial addition) to G 17, "Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod)," Test

Methods G 8, Test Method G 10, Test Method G 11, G 12, "Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel," Test Method G 13, Test Method G 14, G 19, "Test Method for Disbonding Characteristics of Pipeline Coatings by Direct Soil Burial," Test Method G 20, and Test Method G 42. A. J. Doheny and K. Konopka will verify suppliers listed are still available.

The review of G 18, "Test Method for Joints, Fittings, and Patches in Coated Pipelines," G 55, "Method for Evaluating Pipeline Coating Patch Materials," G 62, "Test Methods for Holiday Detection in Pipeline Coatings," G 70, "Test Method for Ring Bendability of Pipeline Coatings (Squeeze Test)," G 80, "Test Method for Specific Cathodic Disbonding of Pipeline Coatings," and G 95 "Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)," was delayed until the next meeting. After polling interested parties, A. J. Doheny and K. Konopka will rewrite the precision statement of G 6, "Test Method for Abrasion Resistance of Pipeline Coatings." More discussions will take place at the next meeting. A. J. Doheny will rewrite sections 11.1 and 11.2 of G 9, "Test Method for Water Penetration into Pipeline Coatings," to conform to editorial practice by the next meeting. The 6 V specification will be addressed. Kelner will be asked to submit a new "Electrical Impedance Spectroscopy" method.

The new D01.48.01 "Laboratory Simulation of Soil Burial" and D01.48.02 "Laboratory Shear Testing" methods were discussed. Six of the seven voters approved the soil burial method. R. W. Geary would like the next test run without the pressurized membrane or a floating surface weight. However, after a discussion, his objection was withdrawn. D01.48 chose to delay balloting until data are shared and clarification can be obtained on the following: (a) drawings are improved; (b) temperature ranges are shown; (c) rationale for 3.0 and 1.5 V dc are given; (d) precision, bias and supplier statements are made consistent with ASTM practices; (e) pressure dependence on CD (research report?) is shown; (f) round-robin data are available; (g) apparatus supply is shown; (h) allowance for different soil types is given. D01.48.01 will work on this method.

The laboratory shear method requires changes in scope, calculations, and practice. The following changes were recommended: (a) curved specimens cut from pipe will be eliminated; (b) hot applied coatings on elastomeric adhesives will be addressed; (c) better drawings are required; (d) a better description of "Heat Block" is needed; (e) a provision for in-

oven testing is needed. Work on this method was assigned to D01.48.02.

The scope of Test Method G 12 may be limited to sections of certain length, based on field experience. K. Konopka and R. G. Eritano will poll manufacturers of non-destructive testing thickness gages for information on bias lines with CP, telluric and AC and geomagnetic induced electrical currents. Precision statements will conform to manufacturers specifications and bias will be determined with NIST reference materials when the long line questions are resolved. Specimen will be used instead of sample. Test Method G 17 was approved as is.

DIVISION 50 PAINT FOR FACTORY APPLICATION

Subcommittee D01.51 Powder Coatings J.R. Hagerlin, Chair

D01.51.01—Polymer Powders and Powder Coatings—E. Waddles, Chair. J. R. Hagerlin presided. He reported that the task group needed a new chair to see D 3451-92, "Practice for Testing Powder," the current practice, through the next and significant revision. J. Hadden agreed to assume chairmanship. Discussion led to review of a Thermal Scanning Rheometer from Rheometrics. G. Wall will gather more information on the device, and potentially less costly versions for the next meeting. In a review of gel time, all powder producers agreed that this test, as currently written, should not be used by consumers for setting specifications.

J. R. Hagerlin introduced a test method cross reference table which could become a part of D 3451. Attendees were asked to review the table, add information, and/or correct as needed. The information should be brought to the January meeting or sent to him. A discussion of test method references in ASTM documents indicated that the attendees did not know whether ASTM documents could reference another agency's (i.e., PCI) documents. J. R. Hagerlin will get clarification before the January meeting. D 3451 may be revised to include thermosetting coatings only.

D01.51.02—Hiding Power of Powder Coatings—M. Sharma, Chair, reported that a new draft of the proposed test method for hiding power would receive too many comments to be addressed in this session. The new draft, #6, was provided by J.R. Hagerlin for all present. Comments are to be sent to M. Sharma

by August 15. R.J. Boni will address section 8, revising to meet current consumer capabilities. M. Sharma will revise the document based on all comments and provide a draft to J.R. Hagerlin by September 15 for redistribution to D01.51 members.

D01.51.03—Spray Characteristics of Powder—M. Thies, Chair, reported that the new guillotine device for the transfer efficiency testing required further modifications, and should be ready for round-robin activity once he completes his testing. Proposed collaborators, and order of testing, are M. Thies, J. Hadden, R.J. Boni, J.D. Pont, and G. Walls. ISO 8130-10, "Deposition Efficiency" is a potential alternate to this test. Members should review the method and prepare to discuss in January.

D01.51.05—Specific Gravity of Powder (Z5402Z)—G. Walls, Chair, with J.R.R. Hagerlin presiding, reported that the method received one D-1 ballot negative vote for "no precision statement." D01.51.05 found the argument not persuasive because precision statements did exist. Editorial changes will be made for improved clarity. D01.51.05 efforts were supported at the D-1 meeting.

D01.51.07—New Subjects—J.R. Hagerlin presiding, reported that a round-robin is in the process for the Gardner "quarter gage" with the following people in order of testing: L. Waelde, D. Montenegro, J. Hadden, R. J. Boni, and J. R. Hagerlin. Initial results from L. Waelde are not encouraging.

R. Chambers. Convener, ISO/TC 35/SC 9/WG 16—Coating Powders, suggested a triangular wedge for determining uncured powder thickness. It will be reviewed with Paul N. Gardner Co. in January 1997.

R.J. Boni reviewed ISO 8130-12 for compatibility of powder coatings to determine how it would fit with ASTM and PCI. With some modification, it appears that the ISO method would be fine for D-1. R.J. Boni reviewed the proposed changes at the ISO/TC 35/SC 9/WG 16 meeting and it appears that ISO will make the changes.

J.R. Hagerlin reviewed information on lower explosive limits of coating powders. The National Fire Protection Association defines the explosion of coating powders in A-13-7 as 30 ounces per 1,000 cubic feet. Other testing organizations say it is 26 ounces per 1,000 cubic feet. J. R. Hagerlin requested the names of testing facilities, other than Chillworth (NJ), Southwest Laboratories (TX), and Factory Mutual (MA). R. Chambers of ISO will be sending J. R. Hagerlin information on calorific value testing done in Europe.

L. Waelde conducted a survey of powder coating suppliers to determine the current test methods for dry powder fluidization and powder sampling techniques. He reviewed three techniques: height of cone, expansion of fluid bed, and the Sames fluidity test. The latter, although fairly expensive (about \$2,500), is the method used in ISO 8130-5. L. Waelde recommended that all three be included in any D-1 method.

L. Waelde reviewed literature on current sampling method and presented his findings. ISO 8130-9 may meet D-1 needs, with modifications suggested by L. Waelde which he will send to J. R. Hagerlin.

D01.51—Powder Coatings—J.R. Hagerlin, Chair, reported that D 5382-95, "Guide to Optical Properties of Powder Coatings," will be published in Volume 6.02 in 1997. A new task group, D01.51.08, liaison to PCI, has been created with E. Marx as Chair. The PCI Test Methods Committee will schedule their winter meeting at the same time and location as D01.51. R. J. Boni is the new D01.51 Vice Chair, replacing J. C. Jernigan who resigned

Subcommittee D01.52 Factory Coated Wood Products S.B. Schroeder, Chair

D01.52b—Hardboard—S. B. Schroeder, Chair, reported that D 2065-91, "Test Method for Determination of Edge Performance of Composite Wood Products under Surfactant Accelerated Moisture Stress," should be rebalotted with the reference to Triton X-100 surfactant replaced by the equivalent chemical description.

D01.52.18—Accelerated Exposure—T. Rieth, Chair, reported on work in progress to extend D 5722-95, "Practice for Performing Accelerated Outdoor Weathering of Factory Coated Embossed Hardboard Using Concentrated Natural Sunlight and a Soak-Freeze-Thaw Procedure," to primed hardboards. Several proposed methods which add freeze-thaw cycles to QUV, Xenon Arc, etc. are being evaluated, but insufficient data was available for definitive conclusions. Additional work will be started this summer using pass fail reference specimens from a large exposure study by the American Hardboard Association.

D01.52.19—Furniture—S.B. Schroeder, Acting Chair, reported little interest or participation by representatives of the furniture industry. Consequently, this task group will become inactive until one of the furniture methods is due for reapproval.

D01.52.15—Film Thickness—S.B. Schroeder, Chair, reported that D. Beamish from DeFelsko was not present to discuss the ASTM method for using the DeFelsko ultrasonic instrument on concrete coatings as a starting point for a wood method. In addition, G. Hora described difficulty in calibration of the instrument on wood in Europe. It was agreed that S. B. Schroeder will discuss these concerns with D. Beamish before the winter meeting. Expansion of D 5235-92 to include video image microscopes as well as optical instruments was also discussed. A ballot for reapproval with a reference to the existence of video microscopes was recommended.

D01.52—The minutes of the last meeting and task group reports were approved and the action of the task group up-held, with a unanimous vote to ballot D 2065-91 for reapproval without the reference to Triton® X-100.

Subcommittee D01.53 Coil Coated Metal R. J. Tucker, Chair

D01.53.01—Pretreatment of Substrates—H.E.G. Rommal, Chair, discussed problems with anomalous chrome-counts. Nonetheless, a round-robin will be initiated within the next six months.

D01.53.03—Accelerated Weathering—D.A. Cocuzzi, Chair, circulated one-year real-time weathering data. At least one additional year of real-time weathering is needed before accelerating weathering can begin.

D01.53.04—Dry Film Thickness—G.R. Pilcher, Chair, discussed the first draft of a set of instructions to accompany panels to be tested according to D 5796-95, "Measurement of Dry Film Thickness of Thin Film Coil-Coated Systems by Destructive Means Using a Boring Device."

D01.53 Coil Coated Metal—R. J. Tucker, Chair. The following was discussed: G. R. Pilcher will contact a coil coated using a commercially available MEK rub tester to determine its effectiveness. R.J. Tucker will discuss with N. Emily the need for a method re the RCA Abrader. G.R. Pilcher has contacted the custodian of D 4214, "Test Methods for Evaluating the Degree of Chalk of Exterior Paint Films," to recommend an amendment such that no particular method of measuring the degree of chalk is associated with a particular substrate.

OSHA/SENAC update: Conventional red oxide structural steel primers will have no slip specification associated with them. The issues involving steel decking is being studied, with the

intent to publish specifications in 2001. D 4146, "Test Method for Formability of Zinc-Rich Primer/Chromate Complex Coatings," will be rebalotted in response to a persuasive negative. Editorial changes will be made to D 3260, "Test Method for Acid and Mortar Resistance of Factory-Applied Clear Coatings on Extruded Aluminum Products," and D 3322, "Practice for Testing Primers and Primer Surfaces Over Preformed Metal." D. A. Cocuzzi announced that R. Tucker, D01.53 Chair, received the D-1 Award of Appreciation. Congratulations to him on receiving this award. We all thank him for his hard work and clear-sighted leadership over the years. The subcommittee wishes to congratulate G.R. Pilcher on becoming the first American to be honored with the title, "Corresponding Member," by the Paints and Pigments Division of the Gesellschaft Deutscher Chemiker.

Subcommittee D01.55 Factory Applied Coatings on Preformed Products R.S. Diem, Chair

D01.55.06—Coating on Plastics—R. S. Diem, Chair, reported the latest draft of D 3002 (6/96) was distributed to the task group attendees. This draft included all changes proposed since the last meeting. Additional editorial changes will be made as well as inclusion of D 587-91 (QU). The revised D 3002 will be submitted for the next subcommittee ballot.

D01.55.11 Mar Resistance of Automotive Clear Coatings—A. F. Rutkiewicz, Chair, stated that D01 (96-01) ballot of Z4875Z "Rub Test Method for Abrasion and Mar Resistance of High Gloss Coatings" resulted in two negatives and two editorial comments. They were found to be persuasive and will be included in a revision to be submitted for D01.55/D-1 ballot. A discussion on the need for the development of a test method based on laboratory mechanical car wash apparatus was held. The task group decided to postpone consideration until discussions between coatings suppliers and Chrysler, Ford, and General Motors on test variability and data interpretation are completed.

D01.55.12—Non-Conductive Coatings for Electrical Protective Equipment—L.E. Thieben indicated that there have been numerous contacts with the power industry and with ASTM F 18 without any response. This task group is to be discharged because of lack of support.

D01.55.13—Exposure of Automotive Coatings to Fleet Service Conditions—A.F. Rutkiewicz, Chair, reviewed a proposed

Guide for the Vehicle Service Exposure of Automotive Coatings. The proposed guide will be upgraded for review at the next meeting with the intent of balloting at the subcommittee level in 1997. Information on fleet testing facilities in the midwest will be collected with the possibility of inclusion in the guide.

D01.55—R.S. Diem, Chair, reported current membership is 31. Negatives and comments were received on the following ballot item: "Test Method for Rub Abrasion Mar Resistance of High Gloss Coatings." See task group report for action. Reapproval of Standard Test Method for Evaluating and Comparing Transfer Efficiency Under Laboratory Conditions. The standard will be resubmitted with a new title: "Test Method for Evaluating and Comparing Transfer Efficiency of Spray Applied Coatings Under Laboratory Conditions." Withdrawal of "Test Method of Quantitative Determination of Cellulose Nitrate in Alkyd Lacquers by Infrared Spectrophotometry." The standard will be submitted for reapproval with a new title: "Test Method of Quantitative Determination of Cellulose Nitrate in Alkyd Modified Lacquers by Infrared Spectrophotometry."

Subcommittee D01.56 Printing Inks J. M. Fetsko, Chair

D01.56.02—Lightfastness of Printed Matter—J.M. Fetsko, Chair, reported that the problem with past round-robins was that ΔE of 10 was chosen as the endpoint, whereas recent NPIRI studies revealed that the discernable color difference for printed ink films depended on the color and ranged from less than 0.5 to as much as 5.0. It was agreed that D 3424 should be revised to serve as a relative method in which results should be reported as pass/fail.

D01.56.04—Viscosity of Paste Inks—J. M. Fetsko, Chair, reported that D 4040, "Test for Viscosity of Printing Inks and Vehicles by the Falling Rod Viscometer," having been inadvertently listed on the D01 (96-01) ballot for withdrawal without replacement, received numerous negative votes. The test method will be updated to delete supplier references and will be submitted for reapproval.

D01.56.06—Apparent Tack—D. M. Ness, Chair, reported that D 4361, "Test Method for Apparent Tack of Printing Inks by the Inkometer," should be revised to reflect the fact that there are now at least four manufacturers of three-roller tackmeters. Information will be obtained on roller diameter and weight in order to determine compliance with the existing test method.

D01.56.14—Setting of Heatset Inks—D. M. Ness, Chair, reported that the subcommittee ballot of the proposed new test method for running comparative setting tests using the Sinvatrol elicited no negative votes but five votes with comments. After suggested changes are made, the method will be submitted for D01.56/D01 ballot.

D01.56.22—Drying of Oxidizable Inks—B. E. Blom, Chair, reported that the new test method for the drying of oxidizable inks by squalene resistance passed the Society ballot and was assigned the number D 5909. The method has since been rebalotted to accommodate suggested changes in terminology that were considered technical rather than editorial.

D01.56.25—Degree of Radiation Curing—E. Kolbylarz, Chair, reported that he has obtained production prints subjected to differing degrees of UV curing. The prints will be tested in-house with the Atlas A.A.T.C.C. Crockmeter prior to distribution to round-robin participants.

D01.56.26—Chemical Resistance—M. Fuchs, Chair, reported that he conducted an in-house study of print resistance to water, bleach, methanol, and liquid detergent. He will repeat the tests with a procedure utilized in the soap industry.

D01.56.28—Tinting Strengths of Liquid Inks—D. M. Ness, Chair, distributed test results of a round-robin utilizing spectrophotometric determination of tinting strength. Two labs who conducted the tests at a later date reported results that are apparent outliers.

D01.56.31—Print Transparency—J. M. Fetsko, Chair, reported that the method developed by a NPIRI Task Force for ISO will be put into ASTM format and checked out with an ink diluted with clear varnish and opaque white. A spectrophotometer with the ability to calculate ΔE will be procured.

D01.56.32—Laboratory Printing—D.M. Ness, Chair, distributed revised copies of the method utilizing the Little Joe. A Significance and Use section must be incorporated to emphasize the need for repeatable prints in order to evaluate appearance properties.

D01.56.33—Print Gloss—J.W. Daugherty, Chair, distributed a draft of a proposed method. It was suggested that it be put into the same format as D 523 Specular Gloss. A pilot study will be conducted with the 16 prints from the lightfastness study.

D01.56.34—Print Problem Terminology—J.W. Daugherty, Chair, distributed a list of print problems that need to be

defined. Members were requested to submit additional terms.

D01.56—Printing Inks—J.M. Fetsko, Chair, announced J.W. Daugherty, D01.56 Secretary, will receive an ASTM Certificate of Appreciation during the ISO/D-1 reception.

Subcommittee D01.57 Artists' Paints and Related Materials

M. D. Gottsegen, Chair

D01.57.02—Lightfastness of Pigments—T. Vonderbrink, Chair. Some of the problem issues in the revision of D 4303, "Test Method for Lightfastness of Pigments Used in Artists' Paints," were reviewed, including the fact that bulbs for the fluorescent box unit are no longer available; it is still possible that another bulb can be substituted. It was again suggested that an HPUV instrument, referenced in D 4674, "Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight," be added to the method. It was agreed to proceed with the revision of Test Method D 4303 and include the D 4674 reference. E.T. Vonderbrink reported that he would have draft revisions available for distribution prior to the next meeting.

Masstone darkening test results were discussed: some of the changes were significant enough to merit a lower lightfastness category rating. A motion to add a "may darken" note for PV 19 and PO 43 to D 5098, "Specification for Artists' Acrylic Emulsion Paints," and D 4302, "Specification for Artists' Oil, Resin-Oil, and Alkyd Paints," was approved.

D01.57.04—Specification for Artists' Paints—B.P. Gavett, Chair. No negatives to date have been reported on the proposal for labeling mixed pigment paints. A.L. Spizzo resigned as chair; R. P. Gavett agreed to serve as D01.57.04 chair.

D01.57.07—Physical Properties—R. Gamblin, Chair. M. D. Gottsegen reported on a lightfastness test of 78 acrylic emulsion gessoes and mediums conducted according to D 5398, "Practice for Visual Evaluation of the Lightfastness of Art Materials by the User." Only seven samples showed changes. J.T. Luke reviewed D 5383, "Practice for Visual Determination of the Lightfastness of Art Materials by Art Technologists," a previous test of colored pencil specimens in which light had leaked under the white felt used on the cover strips. The test was re-done using a neutral gray metal cover and that the problem did not re-occur. After discussion, J.T. Luke pro-

posed to draft a revision for Practice D 5383 and Practice D 5398.

J.T. Luke reported Z. S. Pinney has begun a study of gessoes, gathering information on various brands such as application instructions, health labeling, color and texture, and has developed a list of properties to be considered in a specification. D. Chartier pointed out the necessity of knowing how well a gesso bonds to a substrate and how well paints adhere to the gesso; he said he would do a literature search for the few studies that have been done on this issue. It was agreed there is an obvious need to a gesso standard and interested parties were asked to contact the D01.57.09 chair to urge a draft specification be prepared. Dr. Chartier offered to investigate appropriate test methods on absorption. J. T. Luke reported she had started a study comparing how pigments in various media performed in lightfastness testing and asked for volunteers to continue the project. It was agreed there was currently no pressing need for a specification for oil painting mediums, but D01.57 could easily accommodate such an effort if enough interested people were willing to work on the project.

D01.57.09—Watercolors—W. Upchurch, Chair. It was reported that T. Takigawa had finished the xenon arc tests. The Verilux tests will be finished in March. He would have a report for the next meeting. W. Upchurch explained that manufacturers can do their own in-house lightfastness testing but that an independent source is needed to do outside tests with a sharing of the costs. M. D. Gottsegen said he would discuss with ASTM the possibility of setting up a testing fund in D01.57.

D01.57.10—Consumer Evaluation—J. T. Luke, Chair, reported that she had previously gathered comments regarding the development of a test method on the solubility and removability of picture varnishes, which had focused on the protection of acrylic emulsion paintings for cleaning and restoration, including the removal of varnish and avoiding the use of solvent varnishes in which some paints readily re-solubilize. She said she had gone as far as she could without a test laboratory. Testing would be necessary to develop a specification. D. Chartier commented that he had analyzed more than one-third of the murals in Los Angeles and that none have withstood varnish removal; he also said variables in the application of paints and the type and properties of the walls on which the murals are painted, were more important than location (sun, humidity, radiation). D. Chartier also said that some conservators are using more easily removed varnishes, but that there were

other problems with them—he noted that conservators are beginning to realize that they need to be more careful about the varnishes used in cleaning and preservation. B. P. Gavett, T. Vonderbrink, and R. Woody commented about the testing of manufactured varnishes, and on their removability.

D01.57.11—Gouache Paints—T. Takigawa, Chair, reported D 5724, "Specification for Gouache Paints," has been sent to society ballot.

D01.57.12—Determination of Toxicity—W. Stopford, Chair, reviewed his response to the negatives cast by M. Rossol on the ballot for revision of D 5517, "Test Method for Determining Extractability of Metals from Art Materials," which added a Significance and Use section and additional Reference Documents. W. Stopford said that a Society of Toxicology (SOT) workshop in March 1995 discussed methods of validating Test Method D 5517 and a test method for determining the extractability of aromatic amines from art materials. He said that the SOT workshop recommendations for validating Test Method D 5517 included studies and tests which have been conducted and which will be discussed at the SOT meeting in Anaheim in March 1996.

W. Stopford suggested M. Rossol's negative that dealt with the Significance and Use Section is persuasive and a new statement be written and balloted. The new Significance and Use section proposed reads "This acid extraction method is intended to indicate the solubility of metals from art materials in a weak acid medium. This method may be useful as one indicator of the amount of metal that is readily available for absorption. It is not meant as a replacement for in vivo tests of the absorption of a metal." A motion made to accept this statement passed without objection.

W. Stopford also reported that M. Rossol's negative regarding the changes in the Reference Documents for Test Method D 5517 should be viewed as persuasive and that her proposal for substituted documents be added and balloted, subject to checking the accuracy of the document numbers. The negative was voted persuasive, and the revision of the Referenced Documents section was also passed.

W. Stopford reviewed changes in the 1992 revision of EN71.3 (1988), after which Test Method D 5517 is modeled. He agreed with all the changes except that for the method of centrifugation. W. Stopford said he would incorporate the revisions into Test Method D 5517's definitions, procedures, and that these revisions would be distributed with the next meeting's agenda.

W. Stopford distributed a modification of the DCMA Analytical Method for the Extraction of Aromatic Nitro Amines prepared by the Kirby Health Center test lab for inclusion in the proposed test method for determining the extractability of aromatic anilines from art materials. They explained that this modification should answer objections that the proposed test method is not sensitive enough. There were further informal discussion about batik work with melted crayons, encaustic painting, combustibility labeling, and international standardization. It was suggested that a test method for determining combustibility be developed if one does not already exist; J. T. Luke agreed to investigate with ASTM and the NFPA to see if such a test method does exist.

There was considerable discussion about the possibility of developing a test method for the autocombustibility of linseed oils with and without driers, and other oil-containing art materials. This is in response to a new Connecticut labeling law, and Swedish recommendations on the labeling of such products for combustibility. It was agreed to perform testing at four to six laboratories on products supplied by manufacturers and to write a provisional test method, to enlist the cooperation of the CPSC, and to urge Connecticut to change its law based on this test method to adopt more appropriate warning language in its labeling requirements. The draft test method will use an absorbent rag that is standardized and mass produced. At the next meeting, D01.57 will consider the emergency nature of this provisional test method.

D01.57.14—Colored Pencils—L. Armstrong, Chair, and A. Morrow displayed 267 test specimens from five brands of colored pencils that had been exposed for 195 hours in a Heraeus tabletop xenon arc instrument. Previous studies has used fading in the eight blue wool reference to determine the appropriate irradiance settings and the length of exposure to be used. A report was distributed and explained. Following the exposures, several people visually determined the degree of color change in the test specimens. These ratings were compared with ratings for the same specimens based on measured color difference.

Discrepancies were found between the visual and measured ratings and also between the ratings given by individual observers. Armstrong pointed out that the discrepancies are less important when the ratings are used to assign colored pencils to one of four broad categories: most differences between the visual and instrumental ratings were comparatively small, though a few were as

large as 2.5 blue wool steps. Two probable reasons were given: (1) If a light and a dark color both bleach white in the same test, the light color will have a small total color difference between its original color and white that the darker color will, and thus will receive a higher rating. (2) In the case of near neutral colors, any loss in chroma or change in hue is noted by observers, even though the total color difference is not large. It was suggested that time-to-fade approach be used rather than the amount of fading after a specified amount of irradiation, and difficulties of that method were discussed. Since a natural sun test is not practical for colored pencil specimens, it was questioned whether D01.57 could rely on a one instrument test to place pencils in lightfastness categories. In a discussion of whether to establish lightfastness ratings for pigments rather than require testing of individual pencils, it was noted that colored pencil formulae vary so much that the lightfastness of a single pigment would not reliably predict the lightfastness of a pencil containing that pigment.

D01.57— M.D. Gottsegen, Chair. A motion to make changes in Specification D 5098 and Specification D 4302 regarding masstone darkening was approved. A motion to accept as persuasive the negatives regarding Test Method D 5517 was approved. A motion to accept the revisions in D 5517 as a block was approved. The meeting was turned over to M. D. Gottsegen, the new Chair, who thanked B. P. Gavett for his service over the last four years.

DIVISION 60 PAINT APPLICATION

Subcommittee D01.61 Paint Application Tools F. Burns, Chair

D01.61.01—Paint Brushes—T. J. Sliva, Chair, distributed copies of ASTM D 5913, "Test Method for Evaluation of Cleanability of Paint Brushes" which had successfully completed society ballot and will be published in the 1997 *ASTM Book of Standards, Vol. 06.02*. The various cooperators participated in the mini round-robin on leveling efficiency of brushes reported on their findings. It was the decision of the task group to conduct a round-robin on leveling efficiency of brushes using sealed charts and applying the two or three test coatings using a drawdown applicator to attain a 4 mil. wet film thickness (approximately 400 square feet per gallon coverage). Five

cooperators have agreed to participate. The chair will submit two-three brushes of varying filament finish for testing. The cooperators will bring the paint-outs and report any problems at the January meeting. The task group agreed to review the three ISO methods relating to brush applicators and submit comments and any relevant ASTM methods to ISO for consideration before the next meeting.

D01.61.02—Paint Rollers—F. Burns, Acting Chair, led a discussion on experimental use of D 5150, "Test Method for Hiding Power of Paints Applied by Roller," as a model for a test method for paint rollers. The D 5150 model did not translate into a practical roller differentiating procedure. Discussion also was held on developing a standard practice for physical characterization of paint rollers using D 5301-92 as a model.

D01.61.03—Woven Paint Applicator Fabrics—M. Murray, Chair, distributed Draft #5 to the task group for review. In the significance and use section the chemical composition was added. A few of the changes in the terminology section included: (1) a better definition of a pile fabric to include a base which consists of a backing yarn and a filling yarn; (2) composition of pile, backing and filling in each individual definitions; and (3) a case of major fabric definition was added. Some deletions were made in the sampling section; other minor wording changes throughout the draft were also made. For January, the report section will be written up and a diagram showing the sampling plan and its general and specific names will be presented for discussion. Work on the standard will continue and be sent to members by mid-October for review.

D01.61.05—Bulk Density of Filaments and Bristle—J. Feathers, Chair, reported that the proposed test method for Bulk Density of Level Paintbrush Filaments has been approved by D-1 ballot. D01.61.05 focus will now shift to developing a similar procedure for measuring tapered paintbrush filaments. The chair reviewed the modifications necessary to allow the bundle diameter measurement apparatus to constrict tight enough to measure bundle tips. These modifications have been suggested by C. Martin of T. S. Simms. Martin will be contacted by Feathers to check availability of the modification pieces so that all instruments can be modified prior to testing of tapered filaments. Draft No. 1 of Bulk Density of Tapered Filaments was reviewed and modified by the task group. The group will design round-robin testing with tapered filaments in January once all apparatus are modified. T. O'Brien will supply a procedure

for a circumference measuring device at the January meeting for consideration in developing the tapered procedure.

D01.61.06—Buckling Resistance of Filaments—T. O'Brien, Chair, reviewed modifications to the existing test apparatus. Screw clamping has eliminated clamp slipping. Filament bending has been spring activated to increase speed and a new clamp is being used which permits the use of any length of filament without cutting to a 2in. length. The screw clamping technique is simple and functional. The spring action modification drawing was supplied to all attendees. Drawings of the new clamp will be requested and distributed to involved members. A test method draft will be presented at the next meeting for initial discussion.

D01.61.07—Symposium Planning—The speakers of the symposium presented visual aids and presentation ideas

for critiquing by the task group members. T. J. Sliva will serve as moderator and his introduction will focus on the need for other members of D-1 to fully understand the importance of the applicator and its proper use when evaluating properties of wet paint. F. Burns, Chair of D01.61, will present a 15 minute film on how paint rollers are produced as formulated products. This will be followed by a demonstration showing how two roller covers of differing formulations will produce significantly different results using the same paint on the same surface. G. Harsh, Vice Chair of D01.61, will present a talk on the history and construction of paint brushes and how the various methods of finishing filaments will affect the brush out. The symposium will finish with a review of current ASTM test methods relating to applicators, including a slide presentation of the development of D 4707, test method for measuring paint spatter re-

sistance. It was the decision of the task group to have a final run through on the Sunday night of the January 1997 meeting.

D01.61—F. Burns, Chair, announced that B. Martin of Purdy Corp., a new member, has volunteered to become Chair of Task Group D01.61.02, Paint Rollers. The steward's list was reviewed and new assignments made. The Chair congratulated T. J. Sliva for his leadership efforts in completion of newly issued D 5913, and J. Feathers for his leadership of newly approved D 5959. The latter item passed the D-I ballot. The letter from P. Guevin, D-I recording secretary, explaining changes in ASTM policy in reporting apparatus sources, was distributed and discussed. It was the consensus of this group that these changes do a major disservice to users of ASTM Standards. The chair also discussed inquiries from ABMA members with potential interest in this subcommittee.

June 1996 Subcommittee Reports of ASTM Committee G-3

Subcommittee G03.01 Joint Weathering Projects W. D. Ketola, Chair

Results of the subcommittee ballot on the proposed "Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests" were discussed. A negative from R. Herling was found persuasive. Several comments suggested by R. Herling were also accepted. Draft #9 with the revisions approved at this meeting will be submitted for simultaneous G03/G03.01 ballot.

Draft #2 of the proposed "Practice for Characterizing Weathering Reference Materials Used to Monitor Conditions in an Exposure Test" was discussed. Several changes were proposed and approved. These changes will be incorporated into Draft # 3 and submitted for G03.01 ballot.

Subcommittee G03.02 Natural Environmental Testing J.S. Robbins, III, Chair

D 24, "Practice for Conducting Exposures to Daylight Filtered Through Window Glass," passed G03.02 ballot with no negatives and will proceed to G-3

ballot. G 7, "Practice for Atmospheric Environmental Exposure Testing of Non-metallic Materials," is overdue and will be circulated for G03.02 ballot. G03.02 is also preparing a standard on the construction of black panel thermometers used in outdoor exposure tests.

Subcommittee G03.03 Simulated and Controlled Environmental Testing R.M. Fischer, Chair

G03.03.01—Precision and Bias—R. Fischer, Chair. Responsibility for the draft "Guide for Addressing Variability in Natural and Accelerated Testing of Non-metallic Materials" has been transferred to G03.93 on Statistics. Draft #11 of this proposed guide did pass G-3 ballot and will become an ASTM standard.

G03.03.02—Performance Standards—W. Ketola, Chair, discussed the G-3 ballot results for the new "Practice for Exposing Nonmetallic Materials to Laboratory Light Sources." There were several negative votes along with several affirmative with comment submissions. Most aspects of the negatives were resolved. This general guidance document will be resubmitted for subcommittee ballot. P. Brennan discussed the subcommittee ballot results for three proposed

standards: "Practices for Operating Open Flame Carbon Arc Light Apparatus," "Xenon Arc Light Apparatus," and "Fluorescent UV Light Apparatus for Exposure of Nonmetallic Materials." Three separate task group sessions were held and, again, most of the negatives were resolved. These documents will also be appropriately modified and balloted. A companion document covering procedures for operating enclosed carbon arc devices will also be drafted by R. Brennan.

Subcommittee G03.91 Editorial M.J. Crewdson, Chair

It was brought to the attention of the group that a new ASTM policy permits only one source for any test materials specified in the standard. Where there are two or more equivalents for a particular supply, the editorial staff will reduce this to only one. Prior to publication, the editorial staff will advise the caretaker for each standard that one of the items will be removed.

Chair M.J. Crewdson asked ASTM Staff Member L. Gutman about arrangements for an editorial workshop at the next meeting. A one hour workshop will be coordinated through the Staff Manager.

BALTIMORE—SEPTEMBER

"Natural Weathering vs. Accelerated Weathering"

Educational Committee Chair Debar Allen, of Bruning Paint Co., distributed a questionnaire regarding an ongoing training seminar.

Glenn Bebie, of Q-Panel Lab Products, presented a discussion on "NATURAL WEATHERING VERSUS ACCELERATED WEATHERING."

Mr. Bebie stated that pollution, salt, microbes, fungus, wind erosion, dirt accumulation, and sunlight contribute to weathering. He noted that UVA/UVB account for five percent of the light spectrum, but contribute to 95% of the degradation. The spectrum for UVA light is between 315 and 400 nanometers. The UVB spectrum is in the 300 range.

According to the speaker, polymers, including polyvinyl acetate, polycarbonate, and acrylic, alkyd and polyester resins are vulnerable to UV light. Another contributor to weathering is moisture, especially since items are wet 25 to 50% of the time due to condensation, not rain. The third factor that affects weathering is temperature.

Next, Mr. Bebie spoke on outdoor exposure testing, highlighting exposure angle and specimen mounting. The speaker then discussed accelerated testing. Stressing the importance of latitude, altitude, geography, seasonal variations, and orientation of sample, he recommended Florida and Arizona as sites.

The next type of testing highlighted by Mr. Bebie was the laboratory weathering test. The history of laboratory weathering testing was given and included the begin-

ning which was carbon arc. In the 1930s, sunshine carbon arc was the standard followed by Xenon carbon arc in the 1950s. In the 1970s QUV testing was initiated. Some of the popular models then were the UVB 313 and the FS-40.

Today, the UVA-340 stimulates sunlight up to the 340-350 nanometer range.

Mr. Bebie summarized weathering by stating that natural weathering is more realistic, inexpensive, easy, and an international benchmark; while accelerated weathering offers fast results, is reproducible to ASTM test methods, and is standardized.

COLIN CROWLEY, *Secretary*

CHICAGO—SEPTEMBER

"Advances in Epoxy Coating Technology"

A moment of silence was observed for the passing of Fred Foote.

Technical Committee Chair Keith Moody, of Eastman Chemical Co., is seeking members to join the Committee.

The evening's technical presentation was delivered by David Dubowic, of Air Products and Chemicals, Inc. He spoke on "ADVANCES IN EPOXY COATING TECHNOLOGY."

WILLIAM C. BELLMAN, *Secretary*

GOLDEN GATE—SEPTEMBER

Past-Presidents' Night

A moment of silence was observed for the passing of Society Member Ed Quesada, of the Flecto Co.

The incoming 1996-97 Society officers were introduced. They are: President—Eve Blackburn, of the Flecto Co.; Vice President—Don Mazzone, of Western Equipment Co.; Treasurer—Hal Harlan III, of Harlan Associates, Inc.; Secretary—Tim Specht, of the Flecto Co.; and Society Representative—Pat Shaw, of Radiant Color.

Bob Backlin, of Hüls America Inc., presented Eve Blackburn with the Nuodex President's gavel.

Richard Cooper, of Synergistic Performance Corp., received the Past-President's Pin from Ms. Blackburn.

Dennis Owen, of Technical Coatings Co., stated that the GGSCCT web site is currently

under construction and the Society is seeking a sponsor to maintain the site.

Educational Chair Marnie Hartmann, of Jones-Hamilton Co., displayed a copy of the Pacific Northwest Society's manual that was used for the course "Store and Sales Personnel Coating Course." Ms. Hartmann stated that the PNWSCT has offered the use of their materials if the GGSCCT is interested in conducting this course.

The Scholarship Committee presented two awards for continuing education. Miles Wilson will attend the University of Missouri-Rolla short course and Jim Balcom, of Eureka Chemical Co., will complete his degree.

Melinda Rutledge, of Rheox, Inc., reminded the members about the upcoming Western Coatings Societies' Symposium and Show, slated for February 18-20, 1997, at the Disneyland Hotel, in Anaheim, CA.

Piedmont Society member, Alan Smith, of BASF Corp., spoke on "FACTORS AFFECTING DIRT PICKUP IN LATEX COATINGS."

Mr. Smith stated that cleanliness of a paint surface directly impacts the consumer perception of the condition of a paint job. This is the cause for more recoats than the same degree of chalking or gloss loss. Mr. Smith detailed three-year vertical south exposures where the dirt pickup increases as the T_g decreases such that $-20^\circ\text{C} > > > 0^\circ\text{C} > > 10^\circ\text{C}$. The dirt pickup was measured versus standard by comparison of the delta L values; however, trying to bring this into flat paints posed a problem.

The speaker stated that the T_g effect was overshadowed by the reinforcing qualities of the pigment. It was more possible to effect change when looking at elastomeric coatings. Here it was shown that with a low T_g coating, a crosslink, reduces dirt pickup. The studies also showed a strong effect of humidity on dirt pickup. As for PVC, dirt pickup decreases as polymer content decreases until the CPVC is reached and the porosity causes an increase.

TIM SPECHT, *Secretary*

LOUISVILLE—SEPTEMBER

"Acetylenic Glycols"

Immediate Past-President William Leightner, of C.L. McGuire, Co., presented Society President Andy Traister, of Courtaulds Coatings, Inc., with the Louisville Paint and Varnish Club gavel. In addi-

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tion, Mr. Traister received the Hül's President's Gavel from Rich Powell, of Argus.

The meeting's speaker was Sam Morell, of S.P. Morell & Co. Mr. Morell discussed "THE ROLE OF ACETYLENIC GLYCOLS IN WATERBORNE COATINGS."

Mr. Morell highlighted current problems paint and coatings industry formulators face in addressing increasing restrictive govern-

mental regulations on volatile organic compounds (VOCs). The increasing trend toward waterborne coatings has lent itself to inherent problems such as foam, wetting, water sensitivity, coverage over low energy surfaces, and flow and leveling.

According to the speaker, acetylenic glycols, a chemically unique group of nonionic surface active agents, provide advantages of dynamic wetting, foam control, excellent

coverage, reduced water sensitivity, and improved color development. Chemically acetylenic glycols have a 10 carbon backbone with a rich electron density centered around the carbon-carbon double bond and the hydroxyl groups. This electron rich region produces a hydrophilic characteristic in the region of the molecule due to the increased potential of the resultant dipole. The alkyl side chains with hydrocarbon character produce a hydrophobic nature for these sections of the molecule.

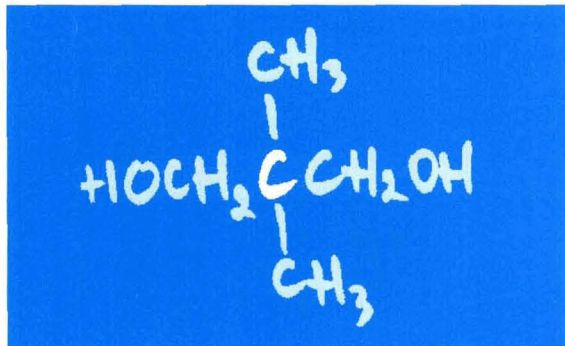
Mr. Morell defined a surfactant as any substance which significantly reduces the surface tension of a liquid at a very low concentration. Surface tension is composed of intermolecular attractions, van der Waals forces, and hydrogen bonding. Water by its very nature has distinct electropositive and electronegative dipoles. This polar covalent entity provides hydrogen bonding between adjoining water molecules in all directions. On the surface of a film, water molecules possess a net attractive force for the bulk solution. Surfactants must reduce surface tension to achieve desired characteristics. By lowering the contact angle, surfactants allow for reduced surface tension and reduced surface pressure.

Mr. Morell said studies indicate that 0.1% acetylenic glycol is very effective in reducing surface tension and as a foam control agent compared to other nonionic surfactants typically used in industry today. Surface chemistry studies show that these highly branched molecules are unique among surfactants in that they do not form micelles and are capable of forming compressible films. Acetylenic glycols rapidly diffuse to interfaces and have the facility to convert hydrophobic surfaces to hydrophilic ones. Acetylenic glycols, when formulated in aqueous coatings, are effective in reducing interaction of low energy surfaces which lead to film imperfections.

CHRIS A. LOCKHART, Secretary

B A S F I N T E R M E D I A T E S

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MONTREAL—SEPTEMBER

"Laboratory Dispersion Equipment"

Bob Hertel spoke on "INNOVATION IN LABORATORY DISPERSION EQUIPMENT: CONSTANT POWER INPUT IMPROVES PROCESS CONTROL."

According to Mr. Hertel, dispersion equipment is frequently used in the paint and coatings industry for the incorporation of pigments or other materials in a coating vehicle. Traditionally, this equipment has been operated at constant rpm for a set period of time. During the dispersion process, the millbase, temperature, and power consumption are rarely controlled. The degree of dispersion is checked by evaluating the fineness of grind, color strength, gloss devel-

opment, or other properties. New patented technology allows dispersion at constant power input by automatically adjusting the rpm according to changes in the millbase viscosity.

HORACE PHILIPP, *Publicity Chairman*

MONTREAL—OCTOBER

"Organic Pigments for Heavy Metal-Free Coatings"

New England Society member Romesh Kumar, of Hoechst Celanese Corp., delivered the evening's presentation on "ORGANIC PIGMENTS FOR HEAVY METAL-FREE COATINGS—SOLVENT AND WATERBORNE SYSTEMS."

Dr. Kumar stated that pigments are used in coatings to provide colored appearance as well as hiding power to cover the substrate. Absorption of specific portion of light by the pigment is responsible for color, whereas both light absorption and scattering by the pigment particles are responsible for the hiding power.

Inorganic pigments affect the hiding power because of strong light scattering due to their relatively high refractive indices, whereas the organic pigments influence the hiding power mainly by absorption light and relatively low light scattering. This is generally true for common organic pigments.

According to Dr. Kumar, blue, green, and purple shades are primarily produced with organic pigments because of their excellent absorption characteristics and good hiding power. However, it still holds true in the paint industry that deep yellow, organic, and red shades are the most difficult colors to produce with common organic pigments.

In the yellow, orange, and red areas of the spectrum, remarkable progress has been achieved through the development of high opacity organic pigments. These new pigments have proved vastly superior to other organic pigments in these color areas in obtaining opacity close to that of inorganic pigments such as molybdate red/orange.

HORACE PHILIPP, *Publicity Chairman*

NEW YORK—SEPTEMBER

Installation of Officers

The Society Officers for 1996-97 were announced as follows: President—John Du, of Hüls America Inc.; President-Elect—Robert W. Schroeder, of Daniel Products Co., Inc.; Secretary—Larry R. Waelde, of Troy Chemical Corp.; Treasurer—Bob Cardin, of Rohm and Haas; and Society Representa-

tive—George Amrich Jr., of Benjamin Moore & Co.

Elected to the Board of Directors are the following: Jeffrey M. McKeon, of Dock Resins Corp.; Rudy Berndlmaier, of King Industries, Inc.; and David P. Tator, of Bayer Corp.

Mike Granito presented the Hüls gavel on behalf of Hüls America Inc.

to President Du. In addition, Irwin Young, of Jesse S. Young Co., Inc., presented an engraved copy of *Robert's Rules of Order* to President Du.

Technical Committee Chair Sheila Westerveld, of Standard Coating Corp., reported that the reactive diluent project is near completion and will be ready for presentation at the 1997 FSCT Annual Meet-

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ing. In addition, Ms. Westerveld noted that a new project on rheology modifiers is beginning.

Larry Waelde reported that planning for the 1997 NYSCT Third Bi-Annual Symposium on Additives and Modifiers for Modern Coatings is underway. Paul Mazer, of Troy Chemical Corp., will be the Chair for the symposium.

Bylaws Committee Chair Ken DePaul, of Whittaker, Clark & Daniels, Inc., read four amendments to the Bylaws that were approved by the Board of Directors and members.

George Schmitz, of S.P. Morell & Co., Inc., presented awards to three exemplary students who were enrolled in the NYSCT technical courses at Fairleigh Dickinson University. They are: Anita Protonentis, of Union Carbide Corp.; Alex Merrin, of Insl-X Corp.; and Igor Kogout, of Daniel Products Co.

Sidney Rubin, of Empire State Varnish Co., presented the Mattiello Memorial Scholarship Award to Cun Young Choi, a doctoral candidate at The Polytechnic Institute, in Brooklyn, NY.

Carter Naylor, of Huntsman Corp., discussed "THE ENVIRONMENTAL SAFETY OF ALKYLPHENOL ETHOXYLATES (APEs)."

Dr. Naylor began by showing several headlines highlighting the overreaction to the possible toxicity of alkylphenol ethoxylates, especially in Europe. He stated that the amount actually necessary to induce a toxic reaction in humans would be huge. Furthermore, Dr. Naylor noted that the amount used in practice was extremely small. He also stated that APEs are biodegradable and will degrade fairly rapidly.

LARRY WAELDE, Secretary

PHILADELPHIA—SEPTEMBER

"Rheology of Waterborne Coatings"

Society President Thomas G. Brown, of Consultants Consortium, accepted the Gaffney Gavel.

Educational Committee Chair Rich Granata, of Lehigh University, announced that the first in a series of educational forums based on the FSCT's Monograph Series will focus on "Corrosion Protection by Coatings."

Wayne Kraus, of Hercules Incorporated, stated that the Eastern Training Conference was a success. Therefore, another of the same type of event is planned for May 11-13, 1998 at the Valley Forge Convention Center.

Southern Society member Roger Hester, of The University of Southern Mississippi (USM), discussed "THE RHEOLOGY OF WATERBORNE COATINGS."

Dr. Hester stated that there are two kinds of instruments, viscometers and rheometers, that measure rheology. Rheometers control sheer rate, while viscometers cannot. Viscometers are good for measuring materials with Newtonian behavior. However, most coatings do not display Newtonian behavior. In addition, there are also dynamic measurements which can measure sheer and drag.

Dr. Hester stated the coatings exhibit extensional behavior, like pulling a rubber band. Splatter resistance is a real strong function of the extentional properties of the coating.

The different types of thickeners include starch, polysaccharides, and associative polymers.

According to Dr. Hester, associative thickeners all have hydrophobic and hydro-

philic moieties within their polymers, and depending on the balance of these, the thickener will make the coating more or less hydrophilic.

Cellulose is pretty much a thing of the past because of the long chain molecules which entangle to produce thixotropy. When put under sheer, these molecules tend to elongate, thus storing energy. When released, this energy leads to splatter.

Dr. Hester explained to the attendees the types of dynamic analyses and design experiments done at USM with a "spring and dashpot theory" where energy is either released or lost as heat. These experiments simulate applications in a patterned and controlled methodology.

SUE NIELSEN, Secretary

ROCKY MOUNTAIN— SEPTEMBER

1996-97 Society Officers

The Society Officers for 1996-97 were announced as follows: President—Paul Delmonico, of Old Western Paint Co.; Vice President—Charles Schroeder, of Fel-Pro Chemical Products L.P.; Treasurer—John Elverum, of Hauser Chemical Research; and Secretary—Mike Zink, of Kwal-Howells, Inc.

Bob Backlin presented the President's Plaque from Hüls America Inc. to President Delmonico.

President Delmonico highlighted the FSCT's strategic plan.

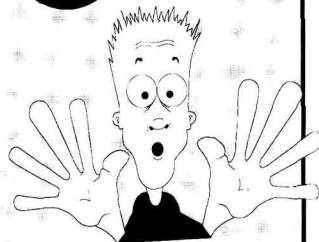
The evening's technical speaker was Piedmont Society member Alan Smith, of BASF Corp. He discussed "FACTORS AFFECTING DIRT PICKUP IN LATEX COATINGS."

MIKE ZINK, Secretary

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BALTIMORE

Active

- Altizer, Tiffany B.—Duron Paints, Beltsville, MD.
 Bishea, Gregory A.—FBI, Washington, D.C.
 Glaeser, Cheryl Ann—Inland Leidy, Inc., Baltimore, MD.
 Kapoor, Sunil—ICF Kaiser International, Fairfax, VA.
 Klara, Cindy S.—Duron Paints, Beltsville.
 Knight, William O.—Bruning Paint Co., Baltimore.
 Mauk, Luke J.—Duron Paints, Beltsville.
 Sutton, Bill—Chemical Specialties, Timonium, MD.
 Taylor, Andrew V.—Duron Paints, Beltsville.
 Webb, Arthur A.—Ocean City Research, Arlington, VA.
 Wood, Thomas M.—The Sherwin-Williams Co., Baltimore.
 Verbitski, Sheryl M.—Duron Paints, Beltsville.

Associate

- Piccolino, Elvio—Witco/OSi Group, Jersey City, NJ.
 Pili-Curtis, Carmen B.—Law Office of Carmen Pili-Curtis, McLean, VA.
 Rothenberg, Stephanie—Thornley Co., Inc., Wilmington, DE.
 Sobolewski, Robert A.—Inland Leidy, Inc., Baltimore, MD.
 Stevenson, Robert B.—Atlas Container, Odenton, MD.
 Tracy, Charles G.—Kohl Marketing Inc., Towson, MD.

CHICAGO

Active

- Alcher, Steve L.—Ace Hardware Corp., Paints Div., Matteson, IL.
 Allen, Jodi B.—Union Carbide Corp., Alsip, IL.
 Bilal, Charity Z.—The Sherwin-Williams Co., Chicago, IL.
 Hardt, Milton I.—Color Communications, Chicago.
 Lister, Rebecca L.—Rock Paint Distributing, Milton, WI.
 Lopez, Guy S.—Federated Paint Mfg., Chicago.
 McGovern, John L.—Testor Corp., Rockford, IL.
 Mehyk, Michael A.—The Sherwin-Williams Co., Chicago.
 Mody, Kam G.—The Sherwin-Williams Co., Chicago.
 Polido, Ferdinand—Benjamin Moore & Co., Melrose Park, IL.
 Sampang, Felixberto—W.C. Richards Co., Blue Island, IL.
 Schaub, Ann M.—Masonite Corp., West Chicago, IL.
 Seffrood, Paul J.—Lilly Industries, Moline, IL.
 Schultz, Alfred K.—Northfield, IL.
 Siddiqui, Adnan—Stepan, Northfield, IL.
 Tomaszewski, Paul R.—Benjamin Moore & Co., Melrose Park.
 Trievedi, Jayant—Industrial Coatings, Chicago.
 Urs, Bhaskar R.—Hentzen Coatings Inc., Milwaukee, WI.
 Waterman, Stefan C.—Behr Process, Chicago Hts., IL.

Associate

- Ahrens, George E.—EPS, Inc., Marengo, IL.
 Bennett, Thomas R.—The Cary Co., Chicago, IL.
 Daniel, John—OSi Specialties, Inc., Lisle, IL.
 Engelbrecht, Karen—The Sherwin-Williams Co., Chicago.
 Holtman, Stephen P.—Chemcentral Corp., Bedford Park, IL.
 Michalski, Donald J.—Commerce Ind. Chemicals, Milwaukee, WI.
 Polen, Edward—Emco Chemical Dist., Inc., N. Chicago, IL.
 Quig, Michael R.—McWhorter Technologies, Carpentersville, IL.
 Scherling, Cliff—Fairmount Minerals, Wedron, IL.
 Scott, Ray—UOP, Des Plaines, IL.

CLEVELAND

Active

- Amato, Gerald M.—ICI-Clidden, Cleveland, OH.
 Bebie, Glenn J.—Q-Panel Co., Westlake, OH.
 Blankschaen, Liz—Coatings Research Group, Inc., Broadview Hts., OH.
 Buchholz, Allan C.—Tremco, Inc., Beachwood, OH.
 Cajulis, Rodrigo D.—BFGoodrich/Algan, Chagrin Falls, OH.
 Chen, Timothy S.—Americem Inc., Cuyahoga Falls, OH.
 Davis, Arthur E.—ICI Paints, Strongsville, OH.
 Depietro, Michael L.—The Sherwin-Williams Co., Cleveland.
 Edwards, Richard A.—The Sherwin-Williams Co., Cleveland.
 Lewis, Max H.—The Sherwin-Williams Co., Cleveland.
 Melby, Earl G.—GenCorp., Akron, OH.
 Nemunaitis, Bradley R.—Dudick Inc., Streetsboro, OH.
 Novak, Heather L.—The Sherwin-Williams Co., Cleveland.
 Reuter, James M.—The Sherwin-Williams Co., Cleveland.
 Rodts, Sarah J.—The Sherwin-Williams Co., Cleveland.
 Szy, Jose Rullen, The Sherwin-Williams Co., Cleveland.
 Yucel, Tavolara—ICI Paints, Strongsville.

Associate

- Coughlin, Marty P.—Specialty Chemical Sales, Cleveland, OH.

- MacDonald Daniel J.—Penn Color, Inc., Hudson, OH.

Educator/Student

- Cajulis, Rodrigo A. Jr.—University of Akron, Chardon, OH.
 Feke, Donald L.—Case Western Reserve University, Cleveland, OH.
 Fox, David W.—Brookpark, OH.
 Lajack, Christine L.—Lajack & Associates, Inc., Rocky River, OH.
 Papczun, William R.—Twinsburg, OH.

DETROIT

Active

- Aslani, Bahman—United Paint & Chemical Corp., Southfield, MI.
 Graber, Shane B.—Sauder Woodwork, Inc., Archbold, OH.
 Helmer, Bradley J.—Dow Chemical, Midland, MI.
 James, Keller—United Paint & Chemical Corp., Southfield.
 Lewis, Bret A.—Epworth Morehouse Cowles, South Haven, MI.
 Lindert, Andreas—Parker Amchem, Madison Hts., MI.
 Maloney, Lisette N.—PRA Laboratories, Ypsilanti, MI.
 Nunez, Elizabeth M.—Ford Motor Co., Ann Arbor, MI.
 Rouge, John M.—Akzo Nobel Coatings, Inc., Troy, MI.
 Silye, Cynthia M.—BASF Corp., Southfield.
 Steiner, Chad B.—Dow Corning Corp., Plymouth, MI.
 Vinsky, Stuart L.—The Standard Products Co., Dearborn, MI.

Associate

- Cohen, Donald K.—Michigan Metrology, Livonia, MI.
 Dong, Ping—Aarbor International, Brighton, MI.

LOUISVILLE

Active

- Canon, Keith—Red Spot Paint & Varnish Co., Inc., Evansville, IL.

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Collignon, Alison M.—Courtaulds Coatings Inc., Louisville, KY.

Hale, William E.—The Valspar Corp., Louisville.
Watson, Peggy A.—Courtaulds Coatings Inc., Louisville.

Associate

Scott L. Andrews—Western Reserve Chemical, Carmel, IN.

Imes, John E.—E.I. Dupont, Dublin, OH.

Stephens, Christopher—C.L. Zimmerman Co., Louisville, KY.

NEW YORK

Active

Burgos, Jose A.—Insl-X Products Corp., Stony Point, NY.

Klein, Charles R.—Ciba Polymers, Brewster, NY.

Landau, Jeffrey A.—Polytex, Bronx, NY.

Miromand, Amir R.—Rhône-Poulenc, Cranbury, NJ.

O'Neil, Michael H.—Polytex, Bronx.

Peterson, Carl C.—Ciba Polymers, Brewster.

Phillips, Morag M.—Insl-X Products Corp., Stony Point.

Zheng, Xudong—Polytex, Bronx.

Associate

Castorina, Thomas J.—Seaboard Sales Corp., Paterson, NJ.

Lemke, Weldon J.—Dow Chemical, Mt. Laurel, NJ.

Melick, Diana J.—Union Carbide Corp., Wayne, NJ.

Young, Lisa J.—Jesse S. Young Co., Inc., Elizabeth, NJ.

PIEDMONT

Active

Bennett, Jeff—The Sherwin-Williams Co., Greensboro, NC.

Blough, David P.—Borden Chemical Inc., Morganton, NC.

McCormell, Jack—Mallard Creek Polymers, Charlotte, NC.

Neal, Allan—Sun Chemical Corp., Charlotte.

Pershing, Lan W.—Technographics, Monroe, NC.

Weemink, Jan M.—Zeneca Pigments & Additives, Charlotte.

SOUTHERN

Active

Anspach, John A.—The Sherwin-Williams Co., Morrow, GA.

Davis, William L.—Farrell-Calhoun, Memphis, TN.

Griffith, Charles L.—Dexter Corp., Birmingham, AL.

Murray, Paul R.—W.M. Barr & Co., Memphis.

Razrak, Shekh Abdul—Composite, Decatur, GA.

Sneed, Michael C.—Evode-Tanner Ind., Greenville, SC.

Tubertini, Greg P.—USG Interiors Inc., Greenville, MI.

Associate

Zaremba, Bill—Brockway Standard Inc., Tampa, FL.

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Martin's West, Woodlawn, MD). COLIN D. CROWLEY, ChemCentral Corp., P.O. Box 690, Fallston, MD 21047.

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). RICHARD J. VICKERMAN, Ciba Polymers Ltd., Duxford, Cambridge, Cambs. CB2 4QA, England.

CDIC (Second Monday—Location alternates between Cincinnati, Columbus, Dayton, and Indianapolis). JOHN E. IMES, DuPont Co., 8065 Holyrood Ct., Dublin, OH 43017.

CHICAGO (First Monday—Sharko's Restaurant, Villa Park, IL). WILLIAM C. BELLMAN, The Valspar Corp., 300 Gilman, Wheeling, IL 60090-5808.

CLEVELAND (Third Tuesday—Monthly meeting site to TBA). JENNIFER L. RUMBERG, The Mahoning Paint Corp., P.O. Box 1282, Youngstown, OH 44501-1282.

DALLAS (Second Thursday following first Wednesday—Dallas Medallion Hotel, Dallas, TX). BILL J. BRISTOL, Jones-Blair Co., 2728 Empire Central, P.O. Box 35286, Dallas, TX 75235.

DETROIT (Second Tuesday—meeting sites vary). RAYMOND S. STEWART, Akzo Nobel Coatings, Inc., 1845 Maxwell St., P.O. Box 7062, Troy, MI 48007-7062.

GOLDEN GATE (Monday before third Wednesday—alternates between Francisco's in Oakland, CA, and Holiday Inn in S. San Francisco). DON MAZZONE, Dowd & Guild, Inc., 14 Crow Canyon Ct., #200, San Ramon, CA 94583.

HOUSTON (Second Wednesday—Medallion Hotel, Houston, TX). LARRY BAUER, O'Brien Powder Products, Inc., 9800 Genard, Houston, TX 77041.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). DEBBIE KOSS, Davis Paint Co., 1311 Iron St., P.O. Box 7589, N. Kansas City, MO 64116.

LOS ANGELES (Second Wednesday—Steven's Steakhouse, Commerce, CA). JOSEPH C. REILLY, Rohm and Haas Co., 432 Cienega Dr., Fullerton, CA 92635.

LOUISVILLE (Third Wednesday—Executive West Motor Hotel, Louisville, KY). CHRIS A. LOCKHART, Reynolds Metals Co., 4101 Camp Ground Rd., Louisville, KY 40211.

MEXICO (Every fifteen days—Gabriel Mancera, Mexico City, Mexico). JORGE HJUELOS BUENFIL, Hi Fil Pinturas, S.A. de C.V., Camino Canteras No. 3, KM 18.5 Carret, Libre Mexico-Puebla, 56400 Los Reyes la Paz, Mexico.

MONTREAL (First Wednesday—Restaurant Le Bifhèque, St. Laurent, Quebec). ROBERT BENOIT, Kronos Canada Inc., 3390 Marie Victorin, Varennes, Que., J3X 1T4 Canada.

NEW ENGLAND (Third Thursday—Best Western TLC, Waltham, MA). DAVID GORVINE, RSM Sales, 79 Park Rd., Lynn, MA 01904.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). LARRY WAELDE, Troy Corp., 8 Vreeland Rd., Florham Park, NJ 07932.

NORTHWESTERN (Second Tuesday—Jax Cafe, Minneapolis, MN). GLEN VETTER, The Valspar Corp., 1101 S. Third St., P.O. box 1461, Minneapolis, MN 55440.

PACIFIC NORTHWEST (PORTLAND SECTION—Tuesday before third Wednesday—Tony Roma's, Mall 205, Portland, OR; SEATTLE SECTION—Third Wednesday—Wyndham Gardes Hotel, Sea-Tac, WA; VANCOUVER SECTION—Thursday after third Wednesday—Abercorn Inn, Richmond, B.C.). BEVERLY SPEARS, Synergistic Performance Corp., 5950 6th Ave., St. Ste. 109, Seattle, WA 98108.

PHILADELPHIA (Second Thursday—DoubleTree Guest Suites, Plymouth Meeting, PA). SUE M. NIELSEN, Best Bros. Paint Manufacturing Co., Inc., 172 Shillington Rd., Sinking Spring, PA 19608-2056.

PIEDMONT (Third Wednesday—Ramada Inn Airport, Greensboro, NC). CLARENCE D. HOFFMAN, Kohl Marketing, Inc., 4 Tarrywood Ct., Greensboro, NC 27455.

PITTSBURGH (Second Monday—Montemurro's Restaurant, Sharpsburg, PA). JOSEPH E. HUNT, Palmer Supplies Co. of Pittsburgh, 8980 Perry Hwy., Pittsburgh, PA 15237.

ROCKY MOUNTAIN (Monday following first Wednesday—DelMonico Hall, Denver, CO). JOHN ELVERUM, Hauser Chemical Research, 5555 Airport Blvd., Boulder, CO 80301.

ST. LOUIS (Third Tuesday—The Salad Bowl Restaurant, St. Louis, MO). LOU L. VOIT, Cemsac Chemicals Corp., P.O. Box 6427, Chesterfield, MO 63006.

SOUTHERN (GULF COAST SECTION—Third Thursday; CENTRAL FLORIDA SECTION—third Thursday after first Monday; ATLANTA SECTION—third Thursday; MEMPHIS SECTION—bi-monthly on second Tuesday; and MIAMI SECTION—Tuesday prior to Central Florida Section). GREG SCHARFETTER, Thompson Minwax Co., 10136 Magnolia Dr., P.O. Box 667, Olive Branch, MS 38654.

TORONTO (Second Monday—Speranza Restaurant & Banquet Hall Convention Centre, Brampton, Ont., Canada). ALEXANDER KING, Tioxide Canada, Inc., 350 Burnhamthorpe Rd., W., Ste. 210, Mississauga, Ont. L5B 3J1, Canada.

Baltimore

- (Nov. 21)—41st Awards Dinner.
 (Jan. 16)—"HOW TO CHOOSE THE RIGHT SILICONE ADDITIVE"—Robert E. Ruckle, OSi Specialties.
 (Feb. 20)—Plant tour of General Motors facility.
 (Mar. 20)—General Meeting—To be announced.
 (Apr. 17)—"HIGH PERFORMANCE EMULSIONS FOR UNIVERSAL PRIMERS"—Mike Wildman, E.P.S. and Nominations.
 (May 15)—Election of Officers.

Chicago

- (Jan. 6)—"ISO 9001/BALDRIDGE EXPERIENCES"—Beth Demarest, DSM Desotech.
 (Feb. 3)—"COALESCING SOLVENTS: VOC AND ODOR"—Mike Anchor, BASF Corp.
 (Mar. 3)—"NEW DEVELOPMENTS IN ACRYLATE MODIFIED EPOXY-AMINE CURED COATINGS"—Michael Bailey, Sartomer Co.
 (Apr. 7)—"GENERAL INDUSTRIAL MELAMINE-CROSSLINKED POLYESTER COATINGS-STRUCTURE/PROPERTY CHARACTERISTICS OF DIBASIC ACIDS AND THEIR RELATIONSHIP TO WEATHERING"—Phil Heidt, Eastman Chemical Co.
 (May 30)—Annual Awards Banquet.

Kansas City

- (Nov. 14)—"DON'T BE A TURKEY—JOIN THE COMPUTER AGE"—Frank Cerra, Tnemec Co.

Los Angeles

- (Nov. 13)—"NEW FILTRATION METHODS FOR TODAY'S COATINGS"—Vorti-Siv Div., M & M Industries.
 (Jan. 8)—Federation Officer Visit. "INTRODUCTION OF A 'NEW' DISPERSION TECHNOLOGY"—Herman Hockmeyer, Hockmeyer Equipment Co.
 (Feb. 12)—Spouses' Night.
 (Mar. 12)—"EFFICIENT USE OF TiO₂ IN ARCHITECTURAL FINISHES"—DuPont White Pigments & Minerals Products.
 (Apr. 9)—Bosses' Night. "RHEOLOGY TESTING FOR THE PAINT INDUSTRY"—Scott Crane, Haake Instruments.
 (May 14)—"THE USE OF POLYOLS A 'NEW GENERATION' IN HIGH PERFORMANCE COATINGS"—Steve Seneker, Arco Chemical Co.
 (June 11)—Annual Meeting and Election of Officers.

New York

- (Nov. 12)—"NEW DEVELOPMENTS IN ACRYLATE MODIFIED EPOXY-AMINE CURE COATINGS"—Michael Bailey, Sartomer Co.
 (Jan. 14)—Speaker—Saul Spindel, D/L Laboratories.
 (Feb. 13)—Legislative Update.
 (Mar. 4)—Mini Workshop—"APPLICATIONS EQUIPMENT, HVLP, ELECTROSTATIC, ETC."—Dennis Stephens, ITW Ransburg; "TOOLS PC SOFTWARE"—T. Wu, Formu; "PAINT TECHNOLOGY SUMMARY FOR THE NEW PEOPLE IN THE INDUSTRY"—George Schmitz, S.P. Morell, Inc.; and "SURFACTANT CHEMISTRY SUMMARY"—speaker from Rhone-Poulenc Co.
 (Apr. 8)—"OPERATING VARIABLES ON MILLING EFFICIENCY AND MATERIAL WEAR"—Gerald Amback, SEPR.
 (May 13)—PaVac Awards Night. "CHEMISTRY OF IRON OXIDES"—George Poldosky, Harcros.

Philadelphia

- (Nov. 14)—"HIGH PERFORMANCE Z COMPONENT WATERBORNE POLYURETHANE COATING SYSTEMS"—William O. Buckley, Air Products & Chemicals Co.

- (Dec. 12)—"AMINE FUNCTIONAL CO-REACTANTS FOR POLYSOCYANATES"—Douglas Wicks, Bayer Corp.
 (Jan.)—Jont meeting with PPCA.
 (Feb.)—Manufacturers' Night.
 (Mar. 13)—"FAILURE ANALYSIS OF COATINGS"—Bud Senkowski, KTA-Tator.
 (Apr.)—Awards Night.
 (May 8)—"DISPERSANTS FOR INDUSTRIAL COATINGS"—Peter Hibbert, ICI.

Rocky Mountain

Denver/Arizona

- (Nov. 11/12)—"IN-LINE & VIBRATORY FILTRATION"—Vorti-Siv Div., M & M Industries.
 (Jan. 6/7)—"INTRODUCTION OF A 'NEW' BASKETMILL DISPERSION TECHNOLOGY"—Herman Hockmeyer, Hockmeyer Equipment Corp.
 (Mar. 10/11)—"EFFICIENT USE OF TiO₂ IN ARCHITECTURAL FINISHES"—DuPont White Pigments & Mineral Products
 (Apr. 7/8)—"RHEOLOGY TESTING FOR THE PAINT INDUSTRY"—Scott Crane, Haake Instruments.
 (May 12/13)—"THE USE OF POLYOLS A 'NEW GENERATION' IN HIGH PERFORMANCE COATINGS"—Steve Seneker, Arco Chemical Co.

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B. Ahn



E. Whitney

The E.T. Horn Co., La Mirada, CA, has named **Bob Ahn** Senior Account Manager in Southern California. Mr. Ahn will provide service to the coatings, composites, adhesives, and ink and graphics industries. He is a member of the Los Angeles Society.

In addition, **Elisabeth Whitney** was appointed Account Manager in Southern California and Utah. A member of the Los Angeles Society, Ms. Whitney will provide service to the coatings, composites, adhesives, and ink and graphics industries.

Neal Machtiger was appointed Industrial Biocides Technology Group Manager for Hüls America Inc., Somerset, NJ. In this position, Dr. Machtiger will oversee all activities of the biocides applications and development groups.

Zeneca Resins, Wilmington, MA, has named **Elizabeth Meyers Armstrong** as General Manager for the Americas. Dr. Armstrong will be responsible for the company's business activities in the Americas and will oversee operations and serve on the Board of Directors of Image Polymers, a joint venture between Mitsui Toatsu Chemicals and Zeneca Resins.

Obituary

William (Bill) Armstrong Smith, Past-President of the Southern Society, died on July 21, 1996. He was 82 years old.

Mr. Smith earned a B.S. Degree in Chemistry from Northeastern University. Thereafter, he formed Dixie Paints. In the early 1950s, he founded Armstrong Smith Paints, which produced paint used to mark roads.

Mr. Smith went through the chairs of the Southern Society during the late 1940s and served as President in 1950. Following his tenure as President, Mr. Smith was a member of the Finance Committee for several years.

Surviving in addition to his wife, Priscilla, are three children; two sisters; and six grandchildren.

Raymond D. Kushner was named Vice President and General Sales Manager for Ranbar Technology Inc., Glenshaw, PA. Mr. Kushner will be responsible for all commercial activities including sales, marketing, and technical service.

Buckman Laboratories International, Inc., Memphis, TN, has announced the promotion of **Patricia L. Browning** to the position of Manager—Strategic Planning. In her new position, Ms. Browning will work with the corporate planning team to develop and communicate the company's strategic plan.

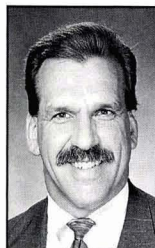
D. Robert Huffman has joined Lonza, Fair Lawn, NJ, as General Manager, Huntington Quat Business.

In addition, **Richard Sheets** and **Tracy Price** have joined the company as Sales Account Managers for Performance Chemicals Eastern Region.

Elf Atochem North America, Inc., Philadelphia, PA, has promoted **Thierry Vasselín** to Marketing Manager of Technical Polymers' Oil & Gas Group. Mr. Vasselín will be responsible for the marketing of Rilsan® polyamide resins and Kynar® PVDF resins to the oil and gas industry.

The Francis L. LaQue Award was presented to **Robert Baboian**, Senior Principal Fellow at Texas Instruments, Inc., Attleboro, MA. Sponsored by LaQue Corrosion Services, Wrightsville Beach, NC, the award recognizes Dr. Baboian's contributions to the field of marine corrosion and corrosion prevention.

Ultra Additives, Paterson, NJ, has appointed **Curtis J. Downs** to the position of International Sales Manager. Mr. Downs will serve as the principle interface between the company and its international distributor network on matters including product line information, research and development, technical support, and customer service. He is a member of the Houston Society.



C.J. Downs

PPG Industries Inc., Pittsburgh, PA, has appointed **John Maaghul** to the position of President, PPG South America. Mr. Maaghul will be responsible for business development and coordination in Central and South America for PPG Industries.

In addition, **Arend W.D. Vos** was named President, PPG Asia/Pacific. Mr. Vos will continue as Regional Coatings and Resins Vice President as well.

Kerr-McGee Corp., Oklahoma City, OK, has named **Mike Webb**, Senior Vice President for strategic planning and business development. Mr. Webb previously served as Senior Vice President responsible for exploration in the company's Exploration and Production business unit.

Replacing Mr. Webb is **Kenneth Crouch**, previously Vice President of North American and International Exploration.

John R. Stevenson was elected Chairman and Chief Executive Officer for McWhorter Technologies, Inc., Carpentersville, IL. Mr. Stevenson will replace **D. George Harris**, who remains on the company's Board of Directors.

In addition, **Jeffrey M. Nodland** was named President and Chief Operating Officer. Mr. Nodland was named Executive Vice President and Chief Operating Officer in 1995.

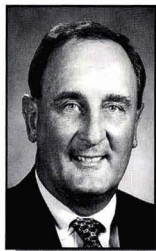
McWhorter Technologies has also named two new vice presidents. **Dan Cox** will serve as Vice President, National Account Sales, and **Doug Smith** will become Vice President, Manufacturing.



J.R. Stevenson



J.M. Nodland



D. Cox



D. Smith



Equipment

IBC/Tank Mixer

The Drum-Mates® DM-600TAS/A is designed to improve quality control for liquid compounds that tend to stratify or settle out. Liquid movement is maximized at all RPM with 5 tiers of adjustable turbine impellers giving a mixing range of 250-950 gallons, with 300-300 rpm (unloaded) at 4 HP (@100 psi), using 10-130 cfm. A new "IBC Mixing Quality Control Program Guideline" has also been issued with the unit.

Circle No. 00 on Reader Service Card

Tempering Furnace

A tempering furnace, electrically heated to a maximum operating temperature of 1400°F, features a rear-mounted, heat resisting alloy circulating fan. Forty-two KW of total power are installed in alloy wire heating elements supported by a stainless steel frame. The six inch insu-

lated walls on the Grieve Corp.'s No. 778 comprise three inch of 2,300°F ceramic fiber and three inch of block insulation.

Circle No. 00 on Reader Service Card

Recirculation Mill

A lab size recirculation mill is used to qualify applications, formulas, and new products. Designed for developers, formulators, and researchers, the air-driven mill is designed for safety and easy cleaning. All wetted parts of this Netzsch Inc. product are constructed of stainless steel, and the adjustable position chamber rotates to the up position for media fill and to the down position for media discharge.

Circle No. 00 on Reader Service Card

Tank Line

Birchwood Casey's BC-40 tank line with Presto® black coating, designed as a cleaner, safer, alternative to hot oxide, is highlighted. The tank system is engineered to provide consistent finish results without red or brown discoloration or white salt leaching. This process is in-

tended for departments having a need for blackening on an occasional basis.

Circle No. 00 on Reader Service Card

High Pressure Pumps

AR North America, Inc., introduces a four-page catalog featuring Spaggiari pumps with complete specifications on five models. This catalog lists features of each pump along with their uses. The pumps range in size from 9 to 70 gpm at 1,450 to 10,000 psi. Typical uses of these pumps include military, mining, and municipal applications, offshore drilling, and pipe and sewer cleaning.

Circle No. 00 on Reader Service Card

Disperser Brochure

The Daymax® disperser, a cavitation processor features a high-shear principle for dissolving, emulsification, and dispersion and is ideal for processing varnishes, inks, pigments, and pharmaceuticals. This disperser line offers seven models for a range of capacity from 10 to 1,000 gal. and up to 300 HP. The Daymax disperser is developed by Littleford Day, Inc., and also features custom engineering as required by the customer.

Circle No. 00 on Reader Service Card



Books/ Publications

Product and Industry Brochure

A brochure by National Starch and Chemical Co. describes the diverse end uses of plant products that fall into these groupings: hot melt adhesives and pressure-sensitive solution polymers, resin emulsion polymers, specialty chemical intermediates, and specialty polymers. Major industries served in this 16-page brochure include chemicals, packaging, paper, personal care, textiles, and wood-working.

Circle No. 00 on Reader Service Card

Dehumidification Handbook

The Cargocaire Div. of Munters Corp. introduces the second edition of *The Dehumidification Handbook*. The handbook serves as a guide to system designers by illustrating and describing the fundamental principles of dehumidification technology and by citing specific examples. *The Dehumidification Handbook* features informative text, reference charts, calculation worksheets, and a guide for minimizing project costs.

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Dehydrated castor fatty acids

COCONUT OILS

Crude coconut • Cochin coconut
Refined 76° coconut • Hydrogenated coconut

SOY AND PALM OILS

Soy salad oil • RB soy oil • Hydrogenated soybean oil
RBD Palm oil • Palm kernel

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Software

Reaction Information System

InfoChem announces the release of COGNOS, a chemical reaction search system based on a new concept for reaction indexing. COGNOS is designed for the Macintosh and includes a database of more than 390,000 chemical reactions.

Circle No. 00 on Reader Service Card

Materials Software Directory

ESM Software has published a materials software directory on its home page on the world wide web. This directory includes descriptions of Macintosh, Windows, and DOS programs that relate to science, ceramics, and polymers. Demonstration copies of several of the programs can be downloaded. This site also links to materials software developers and other materials sites on the Internet.

Circle No. 00 on Reader Service Card

Viscosity Software

A new software package from Brookfield Laboratories allows R&D, QC, and other lab personnel to automate viscosity testing and data collection/analysis. Rheocalc for Windows™ is a multi-tasking package that will allow users to program and collect background data while analyzing previously recorded data. Rheocalc records up to 1,000 data points per test and up to six flow curves can be plotted simultaneously.

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STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Act of August 12, 1970: Section 3685, Title 39, United States Code)

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Federation Officers:
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President-Elect—Jay Austin, 1326 Summer St., Hammond, IN 46320
Treasurer—Thomas Hill, 24 Lily Brooke Ct., East Amherst, NY 14051
Executive Vice President—Robert F. Ziegler, 492 Norristown Rd., Blue Bell, PA 19422

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The Purpose, Function, and Nonprofit Status of This Organization and the Exempt Status for Federal Income Tax Purposes: Have Not Changed During the Preceding 12 Months

Extent and Nature of Circulation:

	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Nearest to Filing Date
A. Total No. of Copies Printed (Net Press Run)	10,732	10,835
B. Paid Circulation		
1. Sales Through Dealers and Carriers, Street Vendors and Counter Sales	0	0
2. Mail Subscriptions	8,720	8,667
C. Total Paid Circulation	8,720	8,667
D. Free Distribution by Mail, Carrier, or Other Means, Samples, Complimentary, and Other Free Copies	181	171
E. Total Distribution	8,901	8,838
F. Copies Not Distributed		
1. Office Use, Left Over, Unaccounted, Spoiled After Printing	1,831	1,997
2. Returns From News Agents	0	0
G. Total	10,732	10,835

I certify that the statements made by me are correct and complete. (signed) Patricia D. Viola, Editor

Archived Articles

Technology Publishing Co. has released JPCL Archives II on CD-ROM, an updated and upgraded collection of the *Journal of Protective Coatings & Linings'* articles published from June 1984 through December 1995. This new Windows-based program has better on-screen appearances and is capable of printing the graphics as well as the articles.

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IR Cards

3M disposable IR cards are available in 250 count packages from Spectra-Tech Inc. These cards fit into the standard slide mount of a spectrometer and can be used for qualitative IR transmission analysis of organic liquids, materials that are soluble in organic solvents, semi-solids, and pastes. The cards reportedly require small volumes of sample to achieve spectral results. (misc.)

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Brush Holder

The paint brush cleaner and holder is an accessory that fits into the top of a paint can. It provides a place for a brush when not in use and also includes a means to scrape excess paint off the brush. This brush holder is available from International Product Design.

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Ink Delivery

A centralized ink delivery system, for use with the PEL series ink jet system, is available from Diagraph Corp. The system was designed for printing applications that require two or more print-heads. The system allows all the print-heads to operate from a single ink source.

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**Reader Service Card
 November 1996 Issue**

Your Company

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- AA Manufacturers of Paints, Varnishes, Lacquers, Printing Inks, Sealants, Adhesives
- BB Manufacturers of Raw Materials
- CC Manufacturers of Equipment and Containers
- DD Sales Agents for Raw Materials and Equipment
- EE Government Agency
- FF Research/Testing/Consulting
- GG Educational Institution/Library
- HH Paint Consumer
- JJ Other

Your Position

(Check One Block)

- KK Management/Adm.
- LL Mfg. & Engineering
- MM Quality Control
- NN Research & Development
- PP Technical Sales Service
- QQ Sales & Marketing
- RR Consultant
- SS Educator/Student/Librarian
- TT Other

001	021	041	061	081	101	121	141	161	181	201	221	241	261	281
002	022	042	062	082	102	122	142	162	182	202	222	242	262	282
003	023	043	063	083	103	123	143	163	183	203	223	243	263	283
004	024	044	064	084	104	124	144	164	184	204	224	244	264	284
005	025	045	065	085	105	125	145	165	185	205	225	245	265	285
006	026	046	066	086	106	126	146	166	186	206	226	246	266	286
007	027	047	067	087	107	127	147	167	187	207	227	247	267	287
008	028	048	068	088	108	128	148	168	188	208	228	248	268	288
009	029	049	069	089	109	129	149	169	189	209	229	249	269	289
010	030	050	070	090	110	130	150	170	190	210	230	250	270	290
011	031	051	071	091	111	131	151	171	191	211	231	251	271	291
012	032	052	072	092	112	132	152	172	192	212	232	252	272	292
013	033	053	073	093	113	133	153	173	193	213	233	253	273	293
014	034	054	074	094	114	134	154	174	194	214	234	254	274	294
015	035	055	075	095	115	135	155	175	195	215	235	255	275	295
016	036	056	076	096	116	136	156	176	196	216	236	256	276	296
017	037	057	077	097	117	137	157	177	197	217	237	257	277	297
018	038	058	078	098	118	138	158	178	198	218	238	258	278	298
019	039	059	079	099	119	139	159	179	199	219	239	259	279	299
020	040	060	080	100	120	140	160	180	200	220	240	260	280	300

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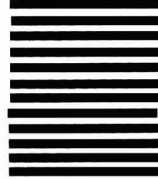
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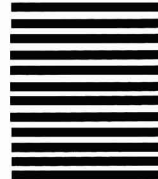
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FEDERATION MEETINGS



For information on FSCT meetings, contact Federation of Societies for Coatings Technology, 492 Norristown Rd., Blue Bell, PA 19422 (610) 940-0777, FAX: (610) 940-0292.

1997

(May 17-18)—FSCT Spring Board of Directors Meeting, May 17—Social Tour; May 18—Board Meeting. Hyatt Regency, Birmingham, England.

(June 20-21)—FSCT Incoming Society Officers Meeting, June 20—FSCT Headquarters Visit, Meeting, and Reception; June 21—Society Officers Meeting. Marriott West, Conshohocken, PA.

(Nov. 3-5)—FSCT Annual Meeting and International Coatings Technology Conference and Expo (Formerly Annual Meeting and Paint Industries' Show). Georgia World Congress Center, Atlanta, GA.

SPECIAL SOCIETY MEETINGS

1997

(Feb. 5-7)—24th Annual International Waterborne, High-Solids, and Powder Coatings Symposium. Sponsored by the Southern Society and The University of Southern Mississippi (USM). New Orleans, LA. (Robson F. Storey or Shelby F. Thames, Co-Organizers, WBHS&PC Symposium, Dept. of Polymer Science, USM, Box 10076, Hattiesburg, MS 39406-0076).

(Feb. 18-20)—Western Coatings Societies' 23rd Biennial Symposium and Show. Sponsored by the Golden Gate, Los Angeles, Pacific Northwest, and Rocky Mountain Societies. Disneyland Hotel and Convention Center, Anaheim, CA. (Robert J. Skarvan, EPS, Inc., 5501 E. Slauson Ave., Los Angeles, CA 90040; (800) 642-7077 or for exhibit space: Roberta Garcia, ICI Paints, 6100 S. Garfield Ave., Los Angeles, CA 90040; (213) 888-8888, ext. 8343).

(Mar. 19)—Mini-Trade Show & Symposium. Sponsored by the Piedmont Society. Showplace on the Park, High Point, NC. (Nellie Moretz, Lilly Industries, 2147 Brevard Rd., High Point, NC 27263; (910) 889-6344).

(Apr. 2-4)—Southwestern Paint Convention. "AIM for the Future—NOW!" Cosponsored by the Dallas and Houston Societies. Hyatt Regency Reunion, Dallas, TX. (General Chairman Bruce Bridges, Texas Resin Co., 2728 Empire Central, Dallas, TX 75235; (800) 492-9400).

(Apr. 30-May 1)—"Additives and Modifiers for Modern Coatings." Symposium cosponsored by the New York Society for Coatings Technology and the Polytechnic University. Holiday Inn-North Conference Center, Newark, NJ. (Paul Mazer, Troy Corp., 8 Vreeland Rd., P.O. Box 955, Florham Park, NJ 07932-0955; (201) 443-0003; fax: (201) 443-0257).

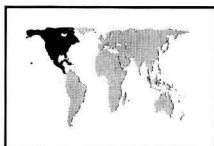
(May 8-10)—50th Annual Spring Symposium. Sponsored by the Pacific Northwest Society. Pan-Pacific Hotel, Vancouver, British Columbia. (Kelvin J. Huget, Imasco Minerals Inc., 19287-98A Ave., Surrey, B.C. V4N 4C8; (604) 888-3848; fax: (604) 888-5671).

(May 12-14)—Southern Society Annual Meeting. King and Prince Beach and Golf Resort, St. Simons Island, GA. (Eve Irvine, J.M. Huber Corp., One Huber Rd., Macon, GA 31298; (912) 750-5433).

OTHER ORGANIZATIONS

1997—North America

(Jan. 8-10)—"Spray Finishing Technology Workshop." Cosponsored by Bowling Green State University and ITW DeVilbiss. ITW DeVilbiss Training Center, Maumee (Toledo), OH. (Richard A. Kruppa, Bowling Green State University, Bowling Green, OH 43403-0301).



(Jan. 20-22)—"Composites '97 Manufacturing & Tooling." Conference and Exhibition sponsored by Society of Manufacturing Engineers (SME). Marriott, Anaheim, CA. (SME Customer Service, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930).

(Jan. 21-24)—"Environmentally Compliant Coatings." Short course sponsored by North Dakota State University (NDSU). Crowne Plaza Resort, Hilton Head Island, SC. (Debbie Shasky, Program Coordinator, NDSU, Dept. of Polymers and Coatings, 54 Dunbar Hall, Fargo, ND 58105).

(Jan. 26-28)—Meeting of the National Board of Registration for Nuclear Safety Related Coating Engineers and Specialists. Sheraton Yankee Trader, Ft. Lauderdale, FL. (D.M. Berger, Executive Director, P.O. Box 56, Leola, PA 17540-0056).

(Jan. 28)—PCI Technical Subcommittee on Test Methods and ASTM D01.51 on Powder Coatings. Sponsored by the American Society for Testing and Materials (ASTM). Embassy Suites, Ft. Lauderdale, FL. (Jeffrey Hagerlin, O'Brien Powder Products, 9800 Genard Rd., Houston, TX 77041-7624).

(Feb. 14-15)—"Spring Decor '97: Paint & Decorating Show." Sponsored by the National Decorating Products Association (NDPA). Charlotte Convention Center, Charlotte, NC. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Feb. 22-24)—"Interiors Decor Showcase '97." Sponsored by the National Decorating Products Association (NDPA). Toronto Congress Centre, Toronto, Ontario, Canada. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Feb. 24-26)—"Basic Coatings for Sales, Marketing, and General Personnel." Short Course sponsored by University of Missouri-Rolla (UMR), St. Louis, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Mar. 1-2)—"Degradation and Stabilization of Polymers." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 3-5)—"Polymer Stabilizers and Modifiers '97: Conference and Exhibit." Sponsored by the State University of New York, Institute of Materials Science and the Division of Polymeric Materials: Science and Engineering of the American Chemical Society (ACS). Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 10-12)—"Introduction to Polymer Colloids/Emulsion Polymers." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 10-13)—"Pigment Dispersions: Science and Technology." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 14-15)—"Paint Volatile Organic Compounds (VOCs)." Training course sponsored by the American Society for Testing and Materials (ASTM). Atlanta, GA. (Kristina Falkenstein, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

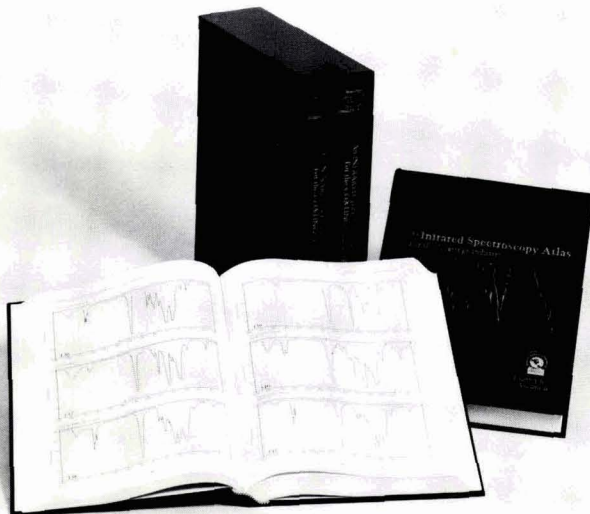
(Apr. 7-10)—12th Annual Advanced Composites Conference and Exposition. Sponsored by The Engineering Society (ESD) and SAE International. Westin Hotel, Renaissance Center, Detroit, MI. (Wael Berrached, ESD, 29355 Northwestern Hwy., Ste. 200, Southfield, MI 48034).

(Apr. 7-11)—"Basic Composition of Coatings." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Apr. 8-10)—Sixth Annual Advanced Coatings Technology Conference & Exposition. Sponsored by The Engineering Society (ESD) and SAE International. Westin Hotel, Renaissance Center, Detroit, MI. (Wael Berrached, ESD, 29355 Northwestern Hwy., Ste. 200, Southfield, MI 48034).

(Apr. 21-24)—"Introduction to Paint Formulation." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

An Infrared Spectroscopy Atlas for the Coatings Industry



Two Volumes—1024 Pages, Over 2500 Spectra

This revised and expanded two-volume, fourth edition contains a compilation of more than 2,500 spectra, fully indexed, of materials commonly used in the coatings industry. All spectra have been generated on high resolution Fourier Transform spectrophotometers with recorded spectral ranges covering the region between 4,000 and 400 cm^{-1} .

Authored by experts in the field of coatings infrared analysis, the 1024-page text consists of eight fundamental and comprehensive chapters, including theory, instrumentation, IR instrumentation accessories, sample preparation, and qualitative and quantitative analysis.

A fully indexed literature survey represents the most complete bibliography published in

this type of text. It is organized into sections such as theory, general information, reviews, instrumentation, experimental techniques, compilation of spectra, quantitative analysis, coatings, polymers applications and pigment applications. Each section is in chronological order.

This handsome set is packaged in a sturdy slip case for easy shelf storage.

Also, a computerized database of all the spectra featured in the Atlas has been developed by the Nicolet Instrument Corp., in cooperation with the Federation. The Nicolet Coatings Technology Database is available at additional cost from Nicolet to assist in computer searching during quantitative infrared analysis.

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(Apr. 23-26)—“Coverings '97.” Flooring exhibition sponsored by TSI, Inc. Orange County Convention Center, Orlando, FL. (Coverings, 900 E. Indiantown Rd., Ste. 207, Jupiter, FL 33477).

(May 1-2)—“Paint Volatile Organic Compounds (VOCs).” Training course sponsored by the American Society for Testing and Materials (ASTM). Chicago, IL. (Kristina Falkenstein, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

(May 7-9)—“Adhesive and Coating Adhesion.” Sponsored by the State University of New York. Orlando, FL. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

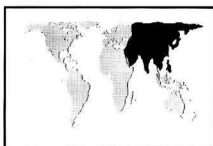
(May 7-9)—“Block and Graft Copolymer Blends.” Sponsored by the State University of New York. Orlando, FL. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(May 19-23)—“Physical Testing of Paints & Coatings.” Short course sponsored by University of Missouri-Rolla (UMR). Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409-0010).

(June 2-6)—“Advances in Emulsion Polymerization and Latex Technology.” Short course sponsored by Lehigh University. Emulsion Polymers Institute, Bethlehem, PA. (Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

1997—Asia

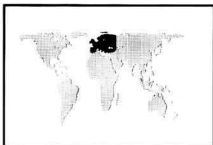
(Mar. 9-11)—India International Coatings Show '97. Sponsored by FMJ International Publications Ltd. World Trade Centre, Bombay, India. (Jane Malcolm-Coe, PR & Publicity Dept., FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey, RH1 1QS, England).



(Oct. 22-24)—“New Developments in Colour Material Science and Technology.” 70th Anniversary Conference on Colour Materials Tokyo sponsored by the Japan Society of Colour Material. Arcadia Ichigaya (Shigaku Kaikan), Tokyo, Japan. (Shuichi Hamada, Japan Society of Colour Material, Kitamura Bldg. 5F, 9-12, 2-chome, Iwamoto-cho, Chiyoda-ku, Tokyo 101, Japan).

1997—Europe

(Feb. 3-5)—“Co-Mold '97.” Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).



(Apr. 8-10)—European Coatings Show '97. Exhibition and conference sponsored by Vincentz Verlag. Nürnberg, Germany. (Vincentz Verlag, Postfach 6247, D-30062 Hannover, Germany).

(Apr. 14-19)—Hannover Fair '97. Industrial fair sponsored by Hannover Fairs USA, Inc. Hannover Fairgrounds, Hannover, Germany. (Andrea Anderson, Project Director, Hannover Fairs USA, Inc., 103 Carnegie Center, Princeton, NJ 08540).

(May 6-7)—“PE '97.” Sponsored by Maack Business Services. Milano, Italy. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(May 12-14)—“Epoxy Technologies for Ambient Cure Protective Coatings.” Sponsored by Paint Research Association. Brussels, Belgium. (Conference Secretary, Paint Research Association, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD England).

(May 29-June 1)—15th SLF-Congress. Sponsored by the Skandinaviska Lackteknikers Förbund (SLF). Lillehammer, Norway. (Bent Haflan, Jotun A/S, P.O. Box 2021 Hasle, N-3235 Sandefjord, Norway; or Svein Singstad, Scanox A/S, P.O. Box 42 Ainabru, Norway).

(June 9-11)—19th Annual International Conference on the Degradation and Stabilization of Polymers. Sponsored by the State University of New York. Luzern, Switzerland. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(June 17-20)—International Intensive Short Course on the Science and Technology of Pigment Dispersions. Sponsored by the State University of New York. Luzern, Switzerland. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(July 7-11)—23rd Annual International Conference on Organic Coatings: Waterborne, High-Solids, and Powdered Coatings. Sponsored by the State University of New York. Athens, Greece. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Sept. 15-17)—“PP '97.” Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(Nov. 3-5)—“PET '97.” Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(Dec. 1-3)—“SP '97.” Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

1998—Europe

(Jan. 20-22)—Powder Coating Europe 98. Sponsored by Vincentz Verlag. Amsterdam Exhibition Centre, Amsterdam, The Netherlands. (Vincentz Verlag, Postfach 6247, D-30062 Hannover, Germany).

(Feb. 2-4)—“ETP '98.” Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

1997—South America

(Sept. 15-17)—Fifth International Paint Congress and Exhibition on Paint Industry Suppliers. Sponsored by the Brazilian Association of Paint Manufacturers (ABRAFATI). Palácio de Convenções do Anhembi, São Paulo, Brazil. (Congress Organization Secretariat, Especifica S/C Ltda., Rua Augusta, 2516-2º andar-cj. 22, 01412-100-São Paulo-SP-Brazil).



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I was very pleased to receive several contributions to the column during the summer, and yet, I was somewhat perplexed in trying to figure out how to fit them all in on a timely basis. I've had some great stuff from Marvin Schnall, Horace Philipp, Bob Athey, Jeff Sturm, Anonymous, and frighteningly enough, Dick Stewart. I apologize for the necessary delay in getting them to the back of the book.

From longtime distinguished FSCT member, Horace Philipp, I received the following labeled "author unknown." I thought it deserved inclusion in its entirety.

Bedtime reading:

Having chosen English as the preferred language in the EEC, the European Parliament has commissioned a feasibility study on ways of improving efficiency in communications between Government departments.

European officials have often pointed out that English spelling is unnecessarily difficult—for example: cough, plough, rough, through, and thorough. What is clearly needed is a phased program of changes to iron out these anomalies. The program would of course be administered by a top level committee of people from participating nations.

In the first year, for example, the committee would suggest using "s" instead of soft "c." Certainly, sivil servants in all sities would resieve this news with joy. Then the hard "c" would be replaced by "k" since both letters are sounded alike. Not only would this clear up konfusion in the minds of klerikal workers, but typewriters (komputers?) could be made with one less letter.

There would be growing enthusiasm when in the second year, it could be announced that the troublesome "ph" would henseforth be written "f." This would make words like "fotograf" 20% shorter in print.

In the third year, public akseptanse of the new spelling kan be ekspeted to reash the stage where more komplikated shanges are possible. Governments would enkourage the removal of double letters which have always been a deterrent to akurate spelling.

We would all agre that the horrible mes of silent "e's" in the languag is disgrasful. Therefore we kould drop these and kontinu to read and writ as though nothing had hapend. By this fim it would be four years sins the skem began and peopl would be reseptive to steps sutsh as replasing "th" by "z." Perhaps zen ze function of "w" kould be taken on by "v," vish is after al half a "w." Shortly after zis, ze unecessary "o" kould be dropped from words kontaining "ou." Similar arguments kould of kors be aplid to ozer kombinations of leters.

Kontinuing zis process yer after yer, ve vud eventuli hav a reli sensibl riten styl. After 20y yerszer vud be no mor trubls, difikutis and evrivun vud find it ezi tu understand ech ozer. Ze dremis of Guvermnt vud finali hav kum tru.

(With sincere apologies to the typesetter . . . Humbug)

This one sent by old friend Marvin Schnall is credited to a Stephen J. Millman, M.D.

"Musings" on Managed Care

The president of a large California health insurance company was also the chairman of the board of his community's symphony orchestra. He could not attend one of the concerts and gave his tickets to the company's director of healthcare cost containment. When the president asked the director how he enjoyed the performance, the director handed him this memorandum:

"The undersigned submits the following comments and recommendations relative to the performance of Schubert's Unfinished Symphony by the Civic Orchestra:

A. The attendance of the orchestra conductor is unnecessary for public performances. The orchestra has obviously practiced and has the prior authorization to play the symphony at the predetermined level of quality. Considerable money could have been saved by merely having the conductor critique the orchestra's performance during a retrospective peer review meeting.

B. For considerable periods, the four oboe players had nothing to do. Their numbers should be reduced and their work spread over the whole orchestra thus eliminating peaks and valleys of activity.

C. All twelve violins were playing identical notes with identical motions. This is unnecessary duplication; the staff of this section should be drastically cut with consequent savings. If larger volume of sound is required, this could be obtained with electronic amplification, which has reached high levels of reproductive quality.

D. Much effort was expended in playing 16th notes. This seems an excessive refinement as most listeners cannot distinguish such rapid playing. It is recommended that all notes be rounded up to the nearest 8th. It would thus be possible to use trainees and lower grade operators with no loss in quality.

E. No useful purpose would appear to be served by repeating with horns the same passage that has already been handled by the strings. If such redundant passages were eliminated, as determined by a utilization review committee, the concert could have been reduced from two hours to twenty minutes, with still greater savings in salaries and overhead. In fact, if Schubert had attended to these matters on a cost containment basis he probably would have been able to finish his symphony."




Dick Stewart confesses from the doghouse:

"I wear a corset. Have done so for years. Ever since my wife found it in the car."

and

"My wife also taught me about religion. I didn't know what Hell was until I married her."

—Herb Hillman, *Humbug's Nest*,
P.O. Box 135, Whitingham, VT 05361.



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