jct JOURNAL OF COATINGS TECHNOLOGY

April 1989

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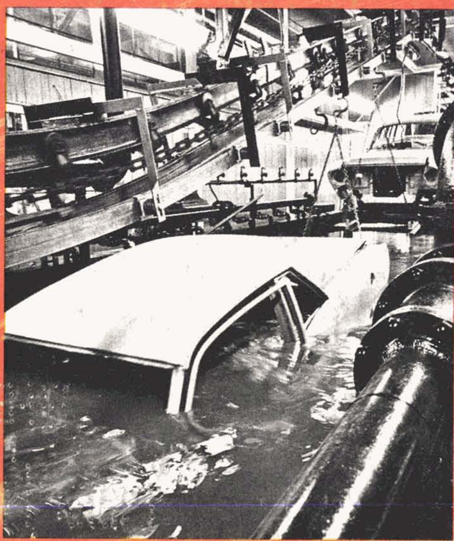

Heating of the Cathode During the Electrodeposition of Cationic Primers

APRIL 1989

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VOLUME 61 NUMBER 771

SOCIETY OF NATIONAL ASSOCIATION PUBLICATIONS

BPA

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The Federation of Societies for Coatings Technology assumes no responsibility for the opinions expressed by authors in this publication.

Comment

Implementing SPC—We're Only As Good As Our Numbers

Last month the Federation sponsored another series of regional seminars on Statistical Process Control for the Coatings Industry. In the three years these seminars have been held, more than 700 attendees have learned how to apply statistical techniques to monitor the consistency of the production process and the resulting product batch to batch.

These techniques are critical to the new manufacturing concept of the way to define and achieve product quality—to make it right the first time.

A key consideration in implementing statistical process control is the reliability and validity of measurement equipment and procedures, to assure uniformity in the accuracy of the instruments and in the methods used by different operators. Laboratories need to evaluate materials and products by means of standard procedures and to obtain results that are in agreement. Reliable testing is basic to quality control of production.

Several years ago, the Federation established a proficiency testing program aimed toward improvement in the reliability of paint and coatings testing and to the development of reproducible test methods.

The program offers a means for participating laboratories to periodically check the level and uniformity of their testing by comparing results with those of other cooperating laboratories. An important by-product of the program is that it provides a realistic assessment of the state of the industry's testing efficiency. Results to date indicate definite need for the program, demonstrating the inability of many labs testing the same paint products to achieve reproducible results.

Improving this proficiency is a must if producers are to verify their ability to test for compliance with specific requirements in response to demands from customers and regulators—demands that can only increase in the coming decade.

Thomas A. Kocis

Thomas A. Kocis,
Contributing Editor

People who look at us this way have a secret advantage.

You are looking at The Dow Chemical Company. Or rather, what The Dow Chemical Company can be for you—a toolbox to help you innovate, market and solve technical problems more easily.

One tool you might use is our research and development labs. This year, they'll cook up more than one million pounds of experimental resin for our customers. (And in the process help them launch several new coatings products.)

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division, with its computer-controlled production that gives you consistent resin quality. (The computer software was developed by Dow engineers over a five-year period. It checks all production variables 86,400 times a day.)

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Abstracts of Papers in This Issue

HEATING OF THE CATHODE DURING THE ELECTRODEPOSITION OF CATIONIC PRIMERS—D.M. Dražić, N.M. Aćamović, and O.D. Stojanović

Journal of Coatings Technology, 61, No. 771, 27 (Apr. 1989)

The results of measuring the surface temperature in the center of a cathode during the deposition of a cationic primer are presented. The measurements were done by means of a Chromel-Alumel thermocouple spot welded to the center of the cathode. It is shown that the cathode reaches 90°C during the deposition of the cationic primer, the temperature being determined primarily by the deposition voltage and the properties of the metal substrate. The reasons for the heating of the metal surface are discussed. During the deposition on the zinc electroplated steel, the dielectric failure of the wet film was observed.

APPLICATIONS FOR ACETOACETYL CHEMISTRY IN THERMOSET COATINGS—F.D. Rector, W.W. Blount, and D.R. Leonard

Journal of Coatings Technology, 61, No. 771, 31 (Apr. 1989)

Acetoacetyl functionality can be incorporated into different classes of resins and used in the preparation of thermoset coatings through a variety of crosslinking mechanisms. Acetoacetyl-functional acrylic resins were prepared using new methacrylic monomer, acetoacetoxyethyl methacrylate, and polyester resins were acetoacetylated by transesterification with ethyl acetoacetate. The acetoacetyl functionality reduced solution viscosity and glass transition temperature. Thermoset coatings were prepared from the acetoacetylated acrylic polymers using conventional melamine and isocyanate crosslinking agents and found to have performance properties similar to corresponding hydroxyl-bearing resins. Several other potential crosslinking reactions are also discussed.

PERFORMANCE OF EXTERIOR FLAT FINISHES ON MEDIUM DENSITY HARDBOARD SIDING—Kansas City Society for Coatings Technology

Journal of Coatings Technology, 61, No. 771, 39 (Apr. 1989)

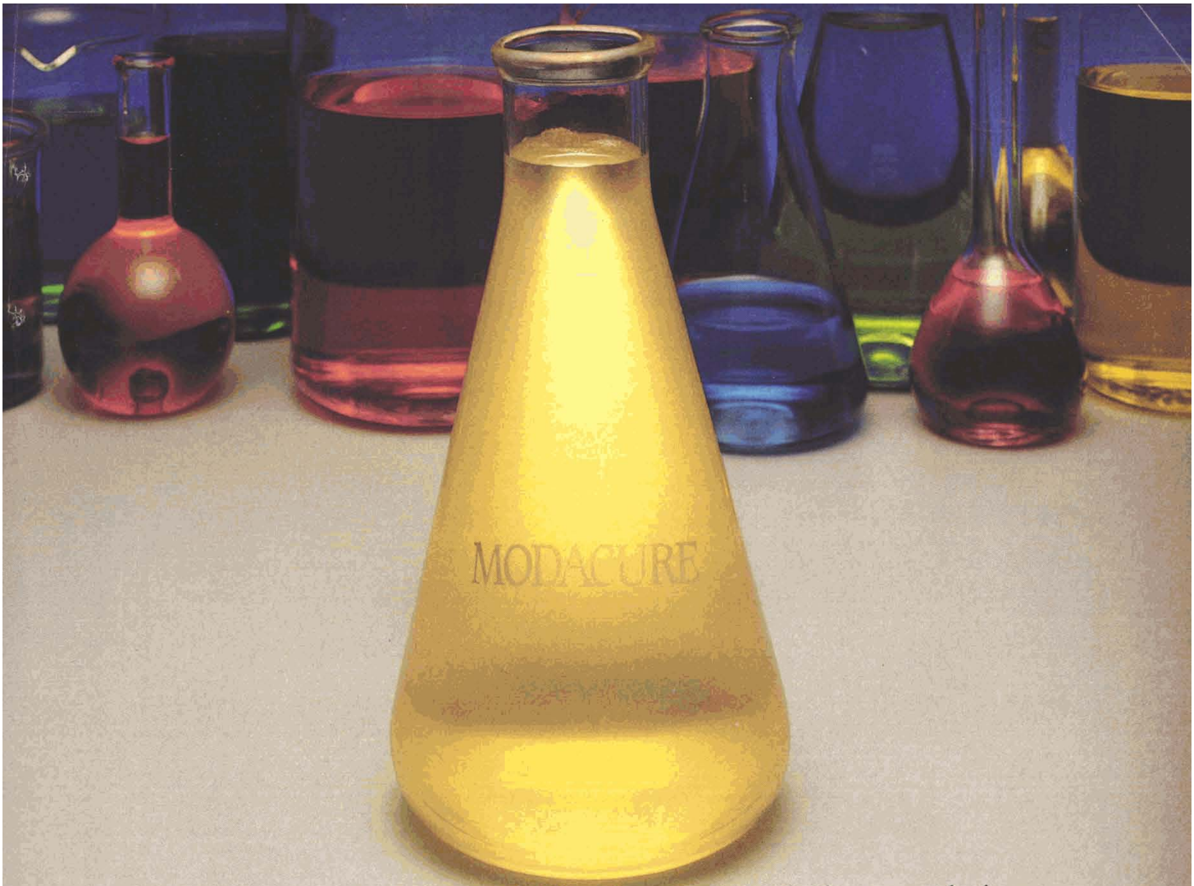
A five-year exposure study comparing the relative performance of several exterior, flat coating systems applied to a variety of commercially available hardboard sidings has demonstrated the superior performance of a two-coat, latex system on this substrate. Acrylic top coats were rated slightly higher than the acrylic terpolymer and vinyl acrylic formulations tested, exhibiting better durability in high PVC top coats and one-coat applications. This difference was much more pronounced on textured hardboard substrates.

The oil/alkyd top coats showed a higher frequency of adhesion and discoloration failures than the latex paints. One-coat, oil/alkyd house paint systems were rated as relatively poor performers.

USE OF POLYACRYLIC ACID ELECTROLYTES DIFFUSED IN ZINC PHOSPHATE CONVERSION COATINGS FOR THE CORROSION PROTECTION OF STEEL—T. Sugama, L.E. Kukacka, N. Carciello, and J.B. Warren

Journal of Coatings Technology, 61, No. 771, 43 (Apr. 1989)

Polyacrylic acid [p(AA)], electrolyte macromolecules diffused into crystalline zinc phosphate (Zn·Ph) conversion coatings that are precipitated onto cold-rolled steel by dissolution-recrystallization processes, enhance the corrosion protection of steel. One of the specific subserviences was that, when the NaOH-dissolution of Zn·Ph is considered, the Zn-OOC electrostatic bonds at p(AA)-Zn·Ph interfaces are transformed into $Na^{+}\,{}^{-}OOC$ ionic bonds which associate with the salt complexed macromolecules. Another is the intermolecular chemical reactions between p(AA) and polymeric topcoats. These contributions relate directly to a lower cathodic delamination rate.



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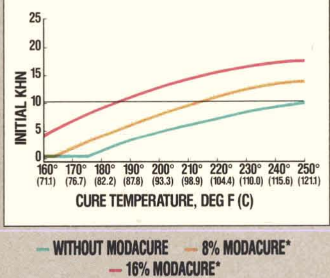

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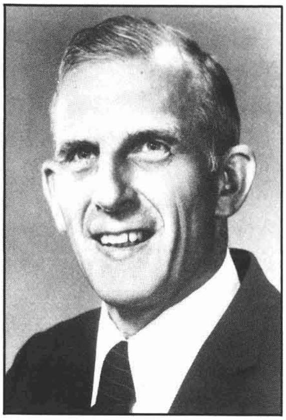
Marco Wismer, Former VP of Science & Technology at PPG, To Present Mattiello Lecture at 1989 Annual Meeting

The Federation of Societies for Coatings Technology is pleased to announce that Marco Wismer, formerly Vice President, Science and Technology, of PPG Industries, Inc., will present the Joseph J. Mattiello Lecture during the 67th Annual Meeting of the Federation, to be held at the New Orleans Hilton, New Orleans, LA, on November 8-10, 1989.



Dr. Wismer's presentation, entitled, "Learning to Leap: Rising to the Technical Challenge of Today's Coatings Industry," will be given on Friday, November 10.

The lecture commemorates the contributions of Dr. Mattiello, who was instrumental in expanding the application of the sciences in the decorative and protective coatings fields. Dr. Mattiello, who served as President of the Federation in 1943-44, was Vice President and Technical Director of Hilo Varnish Corp., Brooklyn, New York, when he died in 1948.

The lecturer is chosen from among those who have made outstanding contributions to science, and is selected to present a paper on a phase of chemistry, engineering, human relationships, or other sciences fundamental to paint, varnish, lacquer, or related protective or decorative coatings.

Career Highlights

Dr. Wismer was graduated from the Zurich Oberrealschule and attended the Swiss Federal Institute of Technology in Zurich, where he earned a Master of Science Degree in Chemical Engineering and a Doctoral Degree in Organic Chemistry.

He was employed by PPG Industries as a Research Chemist in 1956 and was named a Scientist in Polymer Research in 1969. For eight of his 30 years with PPG, Dr. Wismer served as Vice President of Research for the company's Coatings and Resins group. During the last three years of his tenure with the company, Dr. Wismer served as Corporate Vice President of Science and Technology. In that capacity, he directed the corporation's overall scientific and technological efforts.

In his work at PPG, Dr. Wismer was co-inventor of sucrose-based urethane foam, co-inventor of cationic electrodeposition resins, and instrumental in the development of elastomeric and radiation cure coatings. In 1986, he was elected to membership in PPG Industry's Technical Collegium for his many contributions to the company's technological base.

International Lecturer and Author

Dr. Wismer is a well-known lecturer and has served as Chairman of the Gordon Research Conference on Chemistry and Physics of Coatings and Films, and is a Past Chairman of the ACS Division of Polymeric Materials, Science and Engineering.

He has published widely in technical journals and has contributed chapters for several textbooks. He is a member of the Executive Board of the international review journal, *Progress in Organic Coatings*. He holds more than 200 U.S. and foreign patents. In 1973, he won the American Metal Society Award for the development of the first cationic electrodeposition coating and, in 1987, received the American Chemical Society's Roy Tess Award for his contributions to coatings science.

Current Activities

Dr. Wismer is an adjunct member of the Scripps Research Institute in La Jolla, California, as well as a Fellow of the Polytechnic Institute of New York. In addition to polymer chemistry and research management, his current interests include pioneering work in chemotherapy. Following his 1988 retirement from PPG, Dr. Wismer relocated from Pittsburgh to southern California, where he maintains an active consulting practice.

Technical Program Theme and Highlights

The theme of the Federation's Annual Meeting is "Coatings Worldwide: Meeting the Needs of the Nineties." This theme underscores the coatings industry's heightened awareness that it is part of a global marketplace, and that all areas of interest and endeavor are being viewed from an increasingly international perspective. Programming will focus on such areas pertinent to the "Decade of the Nineties" as raw material availability, uses of computers, environmental regulations, new approaches for corrosion control, manufacturing for excellence, and advanced topics on the "cutting edge" of the industry. Also on the program will be the Mattiello Memorial Lecture, Roon Award Papers, Society Papers, and Seminars. Speakers will come from throughout the world of coatings science and manufacture.

Paint Industries' Show

The Paint Industries' Show—the largest and best international exhibit of its kind in the world—will feature attractive exhibitor displays devoted to a wide variety of raw materials, production equipment, containers, laboratory apparatus, testing devices, and services furnished to the coatings manufacturing industry.

The purpose of the Show is to provide attendees with an opportunity to learn of the latest developments in these products and services. Key personnel from the top technical and sales staffs of exhibitors will be on hand. More than 220 exhibitors from the U.S., Canada, and Europe, will utilize almost 74,000 net square feet of exhibit space at the Show. Exhibit hours will be 11:00-5:30 on Wednesday; 9:00-5:30 on Thursday; and 9:00-3:00 on Friday.

The Paint Show will be held at both the New Orleans Hilton's Exhibition Hall and at the adjacent Rivergate Exhibition Center.

Hotels and Reservations

Nine hotels in New Orleans have reserved blocks of rooms for the Annual Meeting and Paint Show. The Federation co-headquarters hotels will be the Marriott and the New Orleans Sheraton.

The other cooperating hotels are: Meridien, Monteleone, Omni Royal Orleans, Westin Canal Place, Doubletree, Holiday Inn Crowne Plaza, and the Hilton Riverside and Towers. The Monteleone and Omni Royal Orleans are located in the

(Continued on page 16)

FSCT Announces Publication of "Marine Coatings," 13th Monograph in Its Series on Coatings Technology

The Federation of Societies for Coatings Technology has announced the recent publication of "Marine Coatings," the thirteenth monograph in its continuing Series on Coatings Technology.

The 28-page monograph is intended for those who have a need to understand marine coatings (but are not coatings technologists), as well as coatings technologists who become involved with the marine industry. Information is provided on coatings technology as it is applied to the severe, and unique, demands of the marine environment. Authors Henry R. Bleile, of the Naval Sea Systems Command (NAVSEA), and Stephen Rodgers, of ARINC Research, Inc., focus on coatings which are primarily used by the marine industry, such as, in shipbuilding and repair, oil drilling platforms, etc. In the marine industry, compatibility with the engineering and construction phases, and economic functionality are primary interests.

The monograph contains definitions of terms from both the coatings and the marine industries. It describes corrosion control coatings, antifouling coatings, and general chemical types of coatings. Discussion focuses on surface preparation and application and continues with the factors required for consideration in selecting coatings systems. The monograph concludes with a description of the three problem areas which affect marine coatings: environmental and occupational health issues, materials quality assurance, and quality assurance of surface preparation and application.

The Series, which is expected to total approximately 35 booklets when completed, serves as a valuable teaching and training resource for the industry.

The first monograph published in the Series is "Film Formation" by Zeno Wicks, Jr. This 20-page booklet includes discussions on film formation by solvent evaporation from solutions of thermoplastic polymers, from solutions of thermosetting polymers, and by coalescence of polymer particles. Attention is also given to the effect of pigmentation on film formation and testing methods.

"Introduction to Polymers and Resins," by Joseph Prane, is a guide which emphasizes the importance of polymeric materials in the coatings industry. Terminology, classification, types, mechanisms, and structures are among the many topics presented in the 36-page publication.

The subject of radiation curing is explored in the 24-page "Radiation Cured Coatings," written by J.R. Costanza, A.P. Silveri, and J.A. Vona. Emphasis is placed on the technology, equipment, and commercial applications of radiation curing. In addition, material and equipment hazards, storage and handling, personnel protection, and toxicity are presented.

"Solvents," by William Ellis, is a 30-page monograph which contains information on solubility parameters, evaporation rates, solvent molecular structures, as well as terpene and oxygenated solvents. Mr. Ellis also focuses on solvents for specific resin types, solvent identification and analysis, and safety and toxicity.

The fifth monograph in the series is "Coil Coatings," by Joseph Gaske. In addition to terminology and coating types, emphasis is placed on problems in the application and use of coil coatings, the processing of precoated coiled metal, testing, and problems in the manufacture and marketing of coil coatings. The monograph contains 20 pages.

Dr. Wicks also contributed the sixth booklet, "Corrosion Protection by Coatings" to the Series. In this 24-page publication, electrochemical corrosion, corrosion protection by intact coatings, corrosion protection with non-intact film, approaches to formulating corrosion protection coatings, and evaluation and testing procedures are explored.

"Mechanical Properties of Coatings," by Loren W. Hill, is a 28-page monograph which introduces the basic concepts involved with the behavior of polymeric materials which help to systematize mechanical property data. Discussion follows on physical property determinations, as well as descriptions of test methods.

The 64-page publication, "Automotive Coatings," authored by Bruce N. McBane, features such topics as coating systems, original finish undercoats, elements of original finish topcoats, solvents and diluents, and specialty coatings. The author also focuses on application techniques, pigmentation, automotive refinishing, and coating evaluation and quality control.

The ninth monograph in the Series is "Coating Film Defects," by Percy E. Pierce and Clifford K. Schoff, of PPG Industries. The 28-page booklet explores the causes and cures of common surface appearance problems. Photographs and discussions focus on many defects, including cratering, fish eyes, flooding, orange peel, telegraphing, and water spotting. Also covered are techniques for the characterization of defects and the measurement of surface properties, as well as general guidelines for the prevention/solution of defects.

The proper choice and use of the application tool, or equipment, to apply a paint or coating is the subject of the tenth monograph, "Application of Paints and Coatings." In this 52-page booklet, author Sidney B. Levinson describes and lists the advantages and limitations involved with the techniques and tools used to coat a product. In addition to brush and spray application methods, details are provided on robotics, dipcoating, electrodeposition, roll coating, curtain coating, and powder coating.

"Organic Pigments," a 40-page publication contributed by Peter A. Lewis, of Sun Chemical Corp., is designed to provide the coatings formulator with an indication of the classes of organic pigments that are available in today's marketplace. In addition, the monograph provides an insight into the chemistry involved in the manufacture of each pigment type, together with the properties associated with each pigment type as they relate to the use in a coatings application. Also addressed are current concerns surrounding employee health and environmental protection as they relate to each class of pigments. The booklet concludes with some predictions of future trends within the pigment industry and their impact on the coatings industry.

The most recent addition to the Series is "Inorganic Primer Pigments," by Alan Smith, of NL Chemicals. The 28-page booklet focuses on inorganic pigments as they are utilized in primers for the protection of metallic substrates. Particular attention is paid to those pigments which are termed anticorrosive. In the monograph, the properties, advantages, and disadvantages of inhibitive pigments are discussed. Barrier pigments, film reinforcers, and extenders are also described. A section on the substrates commonly used in evaluating primers for steel, exterior exposure testing, testing methods, and comparative testing levels concludes this study.

* * *

Development of the Series is under the overall direction of an Advisory Board, whose members assist in selection of authors and review of manuscripts. Dr. Thomas J. Miranda, of Whirlpool Corp., and Dr. Darlene R. Brezinski, of DeSoto, Inc., are Editors of the Series. Members of the Advisory Board, headed by Dr. Miranda, are Dr. Brezinski; Loren Hill, of Monsanto Co.; Joseph Koleske, Coatings Consultant; Stanley LeSota, of Rohm and Haas Co.; Hugh Lowrey, of Perry & Derrick Co., Inc.; and Percy Pierce, of PPG Industries, Inc.

The Series booklets, which are prepared in an attractive 8½ × 11 inch format, designed to fit in a three-ring binder, sell for $5.00 each. Monographs may be ordered by contacting Meryl Cohen, FSCT, 1315 Walnut St., Suite 832, Philadelphia, PA 19107 (215) 545-1506.

Revisions to CIEF By-Laws

The following revised By-Laws of the Coatings Industry Education Fund were approved at the October 18, 1988 annual meeting of the members of CIEF, in Chicago, and are published here as a service to the members of the Federation. The "Policy for the Election of Trustees" was approved by the Board of Trustees of CIEF at its meeting of January 19, 1989.

COATINGS INDUSTRY EDUCATION FUND BY-LAWS

OFFICES

1. The principal office in Delaware shall be in the City of Wilmington, County of New Castle, State of Delaware. The corporation may also have other offices at such other places within and without the State of Delaware as the Board of Trustees may from time to time determine.

SEAL

2. The corporate seal shall have inscribed thereon the name of the corporation, the year of its organization and the words "Corporate Seal, Delaware."

MEMBERS OF THE CORPORATION

3. The members shall be the Directors for the time being of the Federation of Societies for Coatings Technology (hereinafter referred to as the "Federation"). A person shall become a member upon being elected a Director of the Federation, and shall be a member for so long as such member continues to be a Director thereof. A member whose term of office as Director of the Federation expires before an annual meeting of the members shall not be entitled to vote as a member upon any business of the meeting unless and until such person shall have been re-elected a Director of the Federation and thus become a member.

MEETINGS OF MEMBERS OF THE CORPORATION

4. Meetings of members of the corporation may be held at such places within or without the State of Delaware as may be designated by the Board of Trustees.

5. The annual meeting of members shall be held during the last quarter of each year upon such notice as is hereinafter provided.

6. Written notice of the time, date and place of the annual meeting of members shall be mailed to each member at such address as appears on the membership list at least ten days prior to the meeting.

7. Special meetings of members for any purpose or purposes may be called by the President and shall be called at the request in writing of any six of the members.

8. Written notice of a special meeting of members stating the time, place and object thereof shall be mailed to each member at such address as appears on the membership register at least ten days prior to the meeting. The business transacted at such special meeting shall be confined to the objects stated in the notice.

9. The presence in person or by proxy of a majority of the members shall constitute a quorum for the transaction of business at any regular or special meeting.

10. At meetings of the members each member shall be entitled to one vote, and each member may vote in person or by proxy appointed by an instrument in writing subscribed by such member or by such member's duly authorized attorney-in-fact and filed with the Secretary of the corporation.

11. At meetings of members, the President, or in the absence of the President, the Vice-President, or in the absence of the President and the Vice-President, a chairman chosen by a majority of the members present shall act as chairman of the meeting and the Secretary of the corporation, or in the absence of the Secretary, a person appointed by the chairman of the meeting shall act as secretary of the meeting.

BOARD OF TRUSTEES

12. The business and affairs of the corporation shall be managed by the Board of Trustees.

The Board shall consist of the President and not less that two and not more than ten other persons, who shall be elected at the annual meeting of members.

13. A Trustee need not be a resident of the State of Delaware or a member of the corporation.

14. Within ten days after each annual election of Trustees, the Board shall meet at a place designated by the President to elect officers and transact such other business as may be brought before the meeting.

15. Other meetings of the Board may be held at such place within or without the State of Delaware as a majority of the Trustees may from time to time designate or as may be designated by the President in the notice calling the meeting.

16. Regular meetings of the Board may be held at such time and place as shall be determined by the Board.

17. At all meetings of the Board the presence of a majority of the Trustees shall constitute a quorum for the transaction of business, and the act of a majority of the Trustees present at any meetings at which there is a quorum shall be the act of the Board, except as may be otherwise specifically provided by law or by the Certificate of Incorporation or by these By-Laws.

18. Special meetings of the Board may be called by the President on five days' notice to each Trustee, given either personally or by mail or by telegram; special meetings shall be called by the President or Secretary in like manner and on like notice on the written request of two Trustees. Such request shall state the purpose or purposes of the proposed meeting.

19. Vacancies in the Board for any cause, including vacancies resulting from an increase in the number of Trustees, shall be filled by a majority vote of the members of the Corporation at any meeting at which a quorum is present, and each person so elected shall be a Trustee for the full unexpired portion of the term of his or her predecessor, or if the vacancy results from an increase in the number of Trustees, then until the next annual meeting.

OFFICERS

20. The executive officers of the corporation shall be a President, a Vice-President, a Secretary and a Treasurer, who shall be elected by the Board of Trustees at its first meeting after each annual meeting of members of the corporation.

21. The Board may at any time elect such other officers as it shall deem necessary, who shall have such authority and shall perform such duties as from time to time shall be prescribed by the Board.

22. Any two offices may be held by the same person, except the offices of President and Treasurer.

23. The officers of the corporation shall hold office for one year and until their successors are elected and qualify. Any officer elected by the Board may be removed at any time by the affirmative vote of a majority of the entire Board.

24. If the office of any officer of the corporation shall become vacant for any cause, the Board shall elect another person to fill the vacancy, and such person so elected shall hold the office for the unexpired portion of the term.

PRESIDENT

25. The President shall be the chief executive officer of the corporation and shall have general supervision over the business and operation of the corporation. The President shall preside at all meetings of the members of the corporation and of the Board of Trustees. The President shall sign, execute and acknowledge in the name of the corporation, deeds, mortgages, bonds, contracts or other instruments authorized by the Board, and, in general, shall perform all duties incident to the office of president of a non-profit corporation and such other duties as from time to time be assigned by the Board.

VICE-PRESIDENT

26. The Vice-President shall, in the absence or disability of the President, perform the duties and exercise the powers of the President; shall perform such other duties as shall from time to time be assigned by the Board of Trustees or the President or prescribed by these By-Laws.

SECRETARY

27. The Secretary shall act as secretary of all meetings of the Board of Trustees and members of the corporation, and shall keep the minutes of such meetings in the minute book of the corporation. The Secretary shall see that notices are given and records and reports properly kept and filed by the corporation as required by these By-Laws and by law and shall be the custodian of the seal of the corporation and see that it is affixed to all documents to be executed on behalf of the corporation under its seal. The Secretary shall keep the membership book of the corporation and in general shall perform all duties incident to the duties of a secretary of a non-profit corporation and such other duties as may be assigned from time to time by the Board or by the President.

TREASURER

28. The Treasurer shall have custody of the funds or other property of the corporation and shall keep full and accurate accounts of receipts and disbursements of the same in books of the corporation; shall collect and receive all moneys or other properties due the corporation and shall deposit in the name of or to the credit of the corporation all funds or other property of the corporation in such banks or other places of deposit as the Board of Trustees may from time to time designate; shall disburse the funds and deliver other property of the corporation in such manner, at such times and to such person or persons as the Board may from time to time designate; shall, whenever so required by the Board, render an account showing transactions as Treasurer and the financial condition of the corporation and in general shall discharge such other duties as may from time to time be assigned by the board or by the President. The Treasurer shall, if ordered by the Board, give a bond for the faithful discharge of duties in such amount as shall be fixed by the Board. The accounts and books of the Treasurer shall, if ordered by the Board, be audited annually by a firm of certified public accountants appointed by the Board.

INVESTMENT COMMITTEE

29. The Board of Trustees shall utilize the Investment Committee of the Federation to recommend to the Board the manner in which the assets of the corporation should be invested. Decisions involving policy shall be solely determined by the Trustees.

INDEMNIFICATION

30. The corporation shall indemnify any trustee or officer of the corporation who was or is an "authorized representative" of the corporation (which shall mean, for the purpose of this Article, a trustee or officer of the corporation or such a person serving at the request of the corporation as a trustee, officer, partner, fiduciary or trustee of another corporation, partnership, joint venture, trust, employee benefit plan or other enterprise) and who was or is a "party" (which shall include for purposes of this Article the giving of testimony or similar involvement) or is threatened to be made a party to any "proceeding" (which shall mean for purposes of this Article any threatened, pending or completed action, suit, appeal or other proceeding of any nature, whether civil, criminal, administrative or investigative, whether formal or informal, and whether brought by or in the right of the corporation, its members or otherwise) by reason of the fact that such person was or is an authorized representative of the corporation to the fullest extent permitted by law, including without limitation, indemnification against expenses (which shall include for purposes of this Article attorneys' fees and disbursements), damages, punitive damages, judgments, penalties, fines and amounts paid in settlement actually and reasonably incurred by such person in connection with such proceeding unless the act or failure to act giving rise to the claim is finally determined by a court to have constituted willful misconduct or recklessness. If an authorized representative is not entitled to indemnification in respect of a portion of any liabilities to which such person may be subject, the corporation shall nonetheless indemnify such person to the maximum extent for the remaining portion of the liabilities.

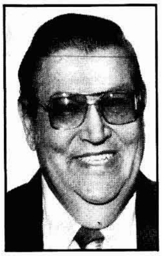
31. The corporation shall pay the expenses (including attorneys' fees and disbursements) actually and reasonably incurred in defending a proceeding on behalf of any person entitled to indemnification under Section 30 of this Article in advance of the final disposition of such proceeding upon receipt of an undertaking by or on behalf of such person to repay such amount if it shall ultimately be determined that such person is not entitled to be indemnified by the corporation as authorized in this Article. The financial ability of such authorized representative to make such repayment shall not be prerequisite to the making of an advance.

32. To further effect, satisfy or secure the indemnification obligations provided herein or otherwise, the corporation may maintain insurance, obtain a letter of credit, act as self-insurer, create a reserve, trust, escrow, cash collateral or other fund or account, enter into indemnification agreements, pledge or grant a security interest in any assets or properties of the corporation, or use any other mechanism or arrangement whatsoever in such amounts, at such costs, and upon such other terms and conditions as the Board of Trustees shall deem appropriate.

33. Each person who shall act as an authorized representative of the corporation shall be deemed to be doing so

(Continued on page 16)

Coatings Industry Education Fund Establishes Joseph A. Vasta Memorial Scholarship



The Coatings Industry Education Fund has announced the establishment of the Joseph A. Vasta Memorial Scholarship Award. The annual scholarship, of $2,500, is a major addition to CIEF's educational programs for the coatings industry.

The award honors the late Joseph A. Vasta, who was a former Trustee of CIEF, and who was well-known for his dedication to furthering the educational opportunities of coatings career-oriented students. Mr. Vasta, as Chairman of the Educational Committee of the FSCT, led the development and production of the Committee-sponsored educational video, "The Choice," which promoted careers in the coatings industry. Mr. Vasta was awarded the Federation's Union Carbide Technology Award, posthumously, at the 1988 Annual Meeting in Chicago. He was a 35-year employee of E.I. du Pont de Nemours & Co., Inc., and at the time of his death in November 1987, was Senior Research Fellow for Du Pont's Fabricated Products Division, in Wilmington, DE.

The scholarship is a result of the Vasta family's wish that the educational ideals held by Mr. Vasta be carried on through contributions in his name to CIEF.

The scholarship award will be made annually, rotating from year to year to an educational institution participating in the Federation's scholarship program. Currently these schools are: University of Detroit, Eastern Michigan University, Kent State University, University of Missouri-Rolla, North Dakota State University, and the University of Southern Mississippi.

The order of rotation of the award was determined by random lottery by the CIEF Board of Trustees. The initial recipient will be the University of Missouri-Rolla.

Selection of the student recipient will be made by the designated school, and the scholarship will be awarded to a single, outstanding student in the school's coatings program, and will be applied to the student's tuition, fees, books, and supplies during their senior year.

Contributions to the Vasta Memorial Scholarship Award may be made in care of the Coatings Industry Education Fund, 1315 Walnut St., Suite 832, Philadelphia, PA 19107.

Annual Meeting Highlights

(Continued from page 12)

French Quarter. All hotel reservations will be processed by the Greater New Orleans Tourist and Convention Commission, which will accept only the official housing form furnished by the Federation.

Special Air Fares

Delta Air Lines, in cooperation with the FSCT, is offering a special discount fare which affords passengers a 40% minimum savings off their round trip, undiscounted day coach fares for travel to the FSCT Annual Meeting and Paint Industries' Show on the airlines' domestic systems. The discount from Canada is 35%.

To take advantage of this discount, you must: (1) Travel between November 4-14, 1989; (2) Purchase tickets at least seven days in advance; (3) Phone 1-800-241-6760 for reservations. Immediately reference the FSCT file number: **U0235.** The special fares are available only through this number.

Discounts are good for both direct and connecting flights to New Orleans. If you use a travel agent, have your reservations placed through the toll-free number to obtain the same fare advantages.

CIEF By-Laws

(Continued from page 15)

in reliance upon the rights of indemnification provided by this Article.

34. All rights of indemnification under this Article shall be deemed a contract between the corporation and the person entitled to indemnification under this Article pursuant to which the corporation and each such person intend to be legally bound. Any repeal, amendment or modification hereof shall be prospective only and shall not limit, but may expand, any rights or obligations in respect of any proceeding whether commenced prior to or after such change to the extent such proceeding pertains to actions or failures to act occurring prior to such change.

35. The indemnification, as authorized by this Article, shall not be deemed exclusive of any other rights to which those seeking indemnification or advancement of expenses may be entitled under any statute, agreement, vote of members or disinterested Trustees or otherwise, both as to action in an official capacity and as to action in any other capacity while holding such office. The indemnification and advancement of expenses provided by, or granted pursuant to, this Article shall continue as to a person who has ceased to be an officer or trustee in respect of proceedings pertaining to actions or failures to act occurring prior to such time, and shall inure to the benefit of the heirs, executors and administrators of such person.

FISCAL YEAR

36. The fiscal year of the corporation shall be the calendar year.

WAIVER OF NOTICE

37. Any notice required to be given by law or the Certificate of Incorporation of the corporation or these By-Laws may be waived by a written instrument, signed by the person or persons entitled to such notice either before or after required time for the notice.

AMENDMENTS

38. The Board of Trustees may make, alter, amend or repeal the By-Laws of the corporation. The procedure herein set forth shall require that 10 days' notice of the time and place of each meeting and of the proposed alteration or amendment to be considered be given.

ADOPTED OCTOBER 18, 1988

POLICY FOR THE ELECTION OF TRUSTEES (Approved January 19, 1989)

RESOLVED, that it be the policy of the members of the Coatings Industry Education Fund that there be elected:

(1) to the Board of Trustees the Chairmen of the Educational, Investment, Professional Development, and Technical Advisory Committees of the Federation and the Treasurer of the Federation.

(2) to the Board of Trustees three members-at-large, who shall serve for three years and one of whom shall be nominated each year by the incoming President of the Federation.

(3) as the Treasurer of the Board of Trustees the Treasurer of the Federation, and as Assistant Treasurer the Executive Vice President of the Federation.

Exxate® solvents outshine PM acetate in polyurethane maintenance coatings

Recent testing and field experience show that Exxate alkyl acetate solvents provide important advantages over methoxypropyl acetate (PM acetate) when used as the active tail solvent and thinner in two-component polyurethane enamels. These advantages result from a unique combination of properties: slow evaporation, low surface tension, and water immiscibility.

Easier application, better appearance

Low evaporation rate and low surface tension combine to minimize dry-spray problems and to improve wetting and flowout for better gloss and appearance. Although Exxate solvents evaporate slowly, the level of solvent retained in the film after curing is less than with PM acetate. Less solvent retained means better coating adhesion and long-term performance.

Higher blister resistance

Tests show that there is an inverse relationship between solubility of water in a solvent and the blister resistance of the applied coating. Hydrophilic solvents like PM acetate absorb water, facilitating and accelerating blister formation. Hydrophobic Exxate solvents, however, resist water dilution and retard blister formation significantly.

Amine-cured epoxies benefit, too

Amine-cured epoxy maintenance coatings also exhibit improved properties–ease of application and higher blister resistance–when Exxate solvents are used.

An approved Mil-Spec thinner

Exxate solvents have been approved for use as thinners in coatings for aircraft and other military equipment (MIL-T-81772B).

Plus low VOC's and low toxicity

Exxate solvents are less dense than PM acetate, so volatile organic compounds are lower for equivalent formulations. Also, Exxate solvents have a low order of acute and subchronic toxicity. Tetralogical and ecological testing demonstrates minimum risk to human health and the environment.

Full technical details

Complete information on tests and comparative properties of Exxate solvents and PM acetate are yours for the asking. Call your Exxon Chemical sales representative or contact Jackie Reynolds at Exxon Chemical Company, P.O. Box 3272, Houston, Texas 77253-3272. Phone: 713/870-6377.

EXXON
CHEMICALS

1989 Paint Industries' Show

Current List of Exhibitors

Aceto Corp.
Advanced Coatings Technologies
Advanced Software Designs
Air Products & Chemicals, Inc.
Alcan-Toyo America, Inc.
Ambrose Co./Pioneer Packaging
American Cyanamid Co.
Amoco Chemical Co.
Angus Chemical Co.
Applied Color Systems, Inc.
Aqualon Co.
Arco Chemical Co.
Ashland Chemical Co., IC&S Div.
Atlas Electric Devices Co.

B&P Environmental Resources
B.A.G. Corp.
BASF Corp., Chemicals Div.
Blackmer Pump/Dover Resources Co.
Bohlin Reologi, Inc.
Brinkmann Instruments, Inc.
Brookfield Engineering Labs., Inc.
Brookhaven Instruments Corp.
Buckman Laboratories, Inc.
Buhler-Miag, Inc.
Bulk Lift International, Inc.
Burgess Pigment Corp.
BYK-Chemie USA

CB Mills
CDF Corp.
CL Industries, Inc.
Cabot Corp. - CAB-O-SIL Div.
Calgon Corp., Div. of Merck Co., Inc.
The Carborundum Corp.
Cardolite Corp.
Cargill, Inc.
Catalyst Resources, Inc.
Chemical & Engineering News
Chemolimpex Hungarian Trading Co.
CIBA-GEIGY Corp.
Clawson Tank Co.
Coatings Magazine
Colloids, Inc.
Color Corp. of America
Colorgen, Inc.
Columbian Chemicals Co.
Contraves Industrial Products Div.
Cook Resins and Additives
Cosan Chemical Corp.
Coulter Electronics, Inc.
Cray Valley Products, Inc.
Crosfield Chemicals, Inc.
Cuno, Inc., Process Filtration Prods.
Custom Metalcraft, Inc.
Cyprus Industrial Minerals Co.

D/L Laboratories
DSA Consulting, Inc.
DSET Laboratories, Inc.
Daniel Products Co.
Datacolor
Day-Glo Color Corp.
Degussa Corp.
University of Detroit
Disti Environmental Systems, Inc.
Dominion Colour Co.
Dow Chemical USA, Latex Prods. Div.
Dow Chemical USA
Dow Corning Corp.
Draiswerke, Inc.
Drew Chemical Corp.
Du Pont Co.

ECC America
EM Industries
Eagle Picher Minerals Inc.
Eastern Michigan University
Eastman Chemical Products, Inc.
Ebonex Corp.
Eiger Machinery, Inc.
Elders-Thorson Chemicals Ltd.
Elmar Industries, Inc.
Engelhard Corp.
Engelhard, Advanced Finishing Tech. Div.
Epworth Manufacturing Co., Inc.
Expancel - Nobel Industries Sweden
Exxon Chemical Co.

Fawcett Co., Inc.
Federation of Societies for Coatings Tech.
Filter Specialists, Inc.
Fisons Instruments/Haake Inc.
Floridin Co.
Freeman Chemical Corp.
H.B. Fuller Co.

GAF Chemicals Corp.
Paul Gardner Co., Inc.
Georgia Kaolin Co.
BF Goodrich - Specialty Polymers
Goodyear Chemical Div.

Haake Inc./Fisons Instruments
Halox Pigments, Div. of Hammond Lead
Henkel Corp.
Hi-Tek Polymers, Inc.
Hitox Corp. of America
Hockmeyer Equipment Corp.
Hoechst Celanese Corp.
Hoechst Celanese Corp.
Horiba Instrument Inc.
J.M. Huber Corp.
Hüls America, Inc.
Hungalu Hungarian Aluminium Corp.
Hunter Associates Lab., Inc.

ICI Resins U.S.
Ideal Manufacturing & Sales Corp.
Illlinois Minerals Co.
Indusmin, Inc.
Industrial Finishing Magazine
ITT Marlow Pumps

S.C. Johnson & Son, Inc. (Johnson Wax)

KTA-Tator, Inc.
Kenrich Petrochemicals, Inc.
King Industries, Inc.

Leeds & Northrup, Unit of General Signal
LogiCom, Inc.
Lubrizol Corp. Coatings Technologies

3M, Industrial Chemicals Div.
Macbeth
Magnesium Elektron, Inc.
Malvern Instruments, Inc.
Malvern Minerals Co.
Manchem Inc.
Manville Sales Corp.
The Mearl Corp.
Micromeritics Instrument Corp.
Micro Powders, Inc.
Mid-States Engineering & Manufacturing
Miller Paint Equipment
Milton Roy Co.
MiniFIBERS, Inc.
University of Missouri-Rolla
Mixing Equipment Co., Inc.
Mobay Corp.
Modern Paint and Coatings
Monsanto Co.
Morehouse Industries, Inc.
Myers Engineering

NL Chemicals, Inc.
NYCO
National Starch and Chemical Corp.
Netzsch Inc.
Neupak, Inc.
Neville Chemical Co.
New Way Packaging Machinery, Inc.

ORB Industries, Inc.
O'Brien Corp.
Ortech International

PPG Silica Prods., a Unit of PPG Industries
PQ Corp.
Pacific Micro Software Engineering
Pacific Scientific Co., Instrument Div.
Packaging Service Co., Inc.
Pfizer Pigments, Inc.
Phillips 66 Co., Specialty Chemicals
Pico Chemical Corp.
Pioneer Packaging Co./Ambrose Co.
Plastican, Inc.
Poly-Resyn, Inc.

The Q-Panel Co.

Raabe Corp.
Red Devil, Inc.
Reichhold Chemicals, Inc.
Renzmann Inc.
Rhone-Poulenc
Rohm and Haas Co.
Rosedale Products, Inc.
Russell Finex, Inc.

Sandoz Chemicals Corp.
Schold Machine Co.
Serac, Inc.
Shamrock Technologies, Inc.
Sheen Instruments
The Sherwin-Williams Co.
Silberline Manufacturing Co., Inc.
Sonoco Fibre Drum, Inc.
University of Southern Mississippi
South Florida Test Service
Spartan Color Corp.
Steel Structures Painting Council
Stone Container Corp., Bag Div.
Sub-Tropical Testing Service
Sun Chemical Corp.

Tammsco, Inc.
Tego Chemie Service USA
Texaco Chemical Co.
Thiele Engineering Co.
Troy Chemical Corp.

Unimin Corp.
Union Carbide Corp.
Union Process Inc.
United Catalysts, Inc., Rheological Div.
Universal Color Dispersions
Unocal Chemicals Div.
U.S. Silica Co.
U.S. Stoneware Corp.

R.T. Vanderbilt Co., Inc.
Velsicol Chem. Corp., Chattanooga Prods.
Velsicol Chem. Corp., Specialty Chems.
Viking Pump, a Unit of Idex Corp.

Wacker Silicones Corp.
Warren Rupp, Inc.
Wilden Pump & Engineering Co.
Witco Corp.

Zeelan Industries, Inc.

Regulatory UPDATE

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 Roy F. Weston, Inc., Washington, D.C.

EPA Extends Date for Mandatory Use of New Manifest Form and Burden Disclosure Statement—EPA has extended the date after which mandatory use of the new hazardous waste manifest form and OMB Burden Disclosure Statement will be required to June 30, 1989. See 54 Federal Register 7036 (February 16, 1989).

The extension means that use of the new manifest form as well as the burden disclosure statement will not be required until July 1, 1989. Those manifest users on June 30, 1989 with supplies of the old manifest can continue to use them if a new expiration date of 9/30/88 is overprinted with the new expiration date of 9/30/91 and the following burden disclosure statement is attached:

> *"Public reporting burden for this collection of information is estimated to average: 37 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment, storage, and disposal facilities. This includes time for reviewing instructions, gathering data, and completing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing this burden to: Chief, Information Policy Branch, PM-223, U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.*

EPA and OMB have outlined three ways in which manifest users can comply with the requirement to attach the burden disclosure statement:

(1) The burden disclosure statement is printed on the new manifest form.

(2) The statement is printed in the instructions to the manifest form:

- (a) On a separate sheet of paper which is removed or detached from the manifest after it is filled out by the generator, and thus would not accompany shipment.
- (b) The instructions are printed on the manifest form, and must accompany shipment.

(3) The statement is attached to the form, and must accompany shipment.

For further information, contact Emily Roth, Office of Solid Waste, (OS-332), U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, (202) 382-4777, or for general information, call the RCRA/Superfund Hotline at (800) 424-9346, or in Washington, D.C., (202) 382-3000.

EPA Proposes to Delete Sodium Sulfate from Community Right-to-Know List—EPA has accepted a petition from the Hoechst Celanese Corporation to delete sodium sulfate (solution) from the list of toxic chemicals under Section 313 of the Superfund Amendments and Reauthorization Act of 1986 (SARA). See 54 Federal Register 7217 (February 17, 1989). EPA has concluded that there is no evidence of adverse human health or environmental effects from sodium sulfate (solution).

Comments are due on or before April 18, 1989 in triplicate to OTS Docket Clerk, TSCA Public Docket Office, (TS-793), U.S. EPA, Room NE-G004, 401 M Street, S.W., Washington, D.C., 20460. Mark comments Attn: Docket Control Number OPTS-400022. For further information, contact Robert Israel, Acting Petition Coordinator, Mailstop OS-120, Emergency Planning and Community Right-to-Know Hotline, U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, (800) 535-0202, or in Washington, D.C. and Alaska (202) 479-2449.

In a related action, EPA denied petitions by the Chemical Manufacturers Association (CMA) to delist ethylene and propylene from Section 313 Community Right-to-Know reporting requirements. EPA rejected the petitions to delist on the grounds that the two chemicals, volatile organic compounds (VOCs), are dangerous pollutants that adversely affect human health and the environment. See 54 Federal Register 4072 (January 7, 1989).

Food and Drug Administration Allows Use of Ethylene-Vinyl Acetate Copolymers—In response to a petition by Cyrovac Division, W.R. Grace and Co., the Food and Drug Administration (FDA) is amending its food additive regulations to allow for the safe use of ethylene-vinyl acetate copolymers as a packaging material intended to contact food during irradiation. See 54 Federal Register 7405 (February 21, 1989).

This amendment was effective February 21, 1989 and written objections and requests for hearings were due on or before March 23, 1989 at Dockets Management Branch (HFA-305), Food and Drug Administration, Room 4-62, 5600 Fishers Lane, Rockville, MD 20857. For further information, contact Vir Anand, Center for Food Safety and Applied Nutrition, (HFF-355), Food and Drug Administration, 200 C Street, S.W., Washington, D.C., 20204, (202) 472-5690.

Clean Air Legislation Status—As was discussed in the March 1989 FSCT *Regulatory Update*, legislation has been introduced in both the House and Senate. In January, Senators Burdick (ND), Durenberger (MN), and Moynihan (NY) introduced S.196, focusing on air emissions from municipal incinerators and ash disposal. Senator Kerry (MA) introduced S.57, dealing with acid rain. Although it was expected that the Environment Committee's legislation, S.1894, of the 100th Congress, might be introduced again as a vehicle for new action, Senator Baucus (MT) has said no. Senator Baucus is the new chairman of the Environment Protection Subcommittee, and has said that the subcommittee will introduce three bills over the next three months: an air toxics bill will be introduced in early April, a bill relating to nonattainment of ozone and carbon monoxide will be introduced in early May, and an acid rain control bill will be introduced June 1. Senator Baucus intends to finish markup of all three bills by the July 4th recess, and report all three to the full committee for action.

Three bills have also been introduced in the House. Rep. Dingell (MI) introduced HR4, relating to air toxics; Rep. Swift (WA) representing the Group of Nine, introduced HR 99 relating to ozone and carbon monoxide nonattainment; and Rep. Cooper (TN) introduced HR 144 on acid rain. The Group of Nine is a bipartisan group of Representatives formed in order to develop consensus on Clean Air Act legislation in the House. Rep. Waxman (CA), Chairman of the Health and the Environment Subcommittee, held hearings on the adverse health effects of ozone and carbon monoxide and is expected to introduce legislation sometime soon.

National Toxicology Program Proposes Chemicals as Carcinogens—In its *Sixth Annual Report on Carcinogens*, the National Toxicology Program is proposing to list two chemicals as new additions to its list of known carcinogens, and 11 chemicals to be listed as reasonably anticipated to be carcinogens. The National Toxicology Program (NTP) is required by Congress to list carcinogens, either as "known carcinogens," or "reasonably anticipated to be carcinogens." See 54 Federal Register 8399 (February 28, 1989).

Known to Be Carcinogens	CAS No.
Erionite	66733-21-9
1-(2-Chloroethyl)-3-(4-methyl-cyclohexyl)-1-Nitrosourea (me-CCNU)	13909-09-6

Reasonably Anticipated to Be Carcinogens	CAS No.
Acetaldehyde	75-07-0
Acrylamide	79-06-1
Bromodichloromethane	75-27-4
Butylated hydroxyanisole	25013-16-5
Cisplatin	15663-27-1
Ethyl methanesulphonate	62-50-0
Methyl methanesulphonate	66-27-3
N-methyl-N-nitro-N-nitrosoguanidine (MNNG)	70-25-7
4-(N-nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4
Ochratoxin A	303-47-9
Silica, crystalline	7631-86-9

The NTP is also proposing to delete 5-nitro-ortho-anisidine (CAS No. 99-59-2) and para-nitrosodiphenylamine (CAS No. 156-10-5) from the list of "reasonably anticipated to be carcinogens."

The NTP has proposed to move the group of substances "aflatoxins" from the reasonably anticipated to be carcinogens to the "known to be carcinogens" list.

Comments should be sent on or before April 14, 1989, to the National Toxicology Program, Public Information Office, MD B2-04, P.O. Box 12233, Research Triangle Park, NC 27709. For further information, call the NTP Public Information Office at (919) 541-3991, or contact them at the above address.

EPA Amends Land Disposal Restrictions—EPA has delayed a ban on land disposal of all untreated leachate from hazardous wastes (other than from the listed dioxin-containing wastes) until mid-1990. EPA has placed the multisource leachate in the third-third of scheduled wastes. See 54 Federal Register 8264 (February 27, 1989).

EPA's action on land ban is in three phases, and the third phase involves banning approximately 427 wastes from land disposal. EPA has divided the third phase into three sections: first-third, second-third, or third-third wastes, with the first-third wastes being the highest volume, highest hazard wastes, and third-third wastes being lowest volume, lowest hazard wastes.

For the third-third wastes, such as multi-source leachate, the HSWA deadline for BDAT standards is May 8, 1990. Therefore, leachate, like other third-third wastes, can be disposed of in landfills or surface impoundments without being previously treated until May 8, 1990, or until a BDAT is finalized, whichever comes first. The landfills and surface impoundment must meet RCRA technology standards (e.g., leachate collection, double liner, etc.).

Federally mandated land-disposal bans will remain in place on untreated leachate derived from any one hazardous waste stream, called single-source leachate, that was disposed of before January 1981.

The effective date of this regulation was February 27, 1989. For further information, contact Steven E. Silverman, Office of General Counsel, (LE-1325), U.S. EPA, 401 M Street, S.W., Washington, D.C., 20460, (202) 382-7706, or the RCRA/Superfund Hotline at (800) 424-9346 or in the Washington, D.C., area at (202) 382-3000.

EPA Signs Testing Consent Order for Chemical Used as Secondary Antioxidant—EPA has signed an enforceable testing consent order for diisodecyl phenyl phosphite (PDDP) (CAS No. 25550-98-5). PDDP is used in insecticide intermediates and as plastic stabilizers/antioxidants. Its primary use is as a low cost heat/light stabilizer and secondary antioxidant for polymeric materials, including vinyl polymers and polyurethanes, poly (ether ester) rubbers, and epoxy resins. See 54 Federal Register 8112 (February 24, 1989).

PDDP was listed in the Interagency Testing Committee's (ITC) 17th Report to EPA, in November 1985. The chemical was listed under Part C, chemicals recommended without designation for response within 12 months, under the section 4(e) priority list of the Toxic Substances Control Act (TSCA).

On November 9 and 11, 1988, Borg-Warner Chemicals, Inc., Witco Corporation, and Dover Chemical Corporation signed the Testing Consent Order for PDDP. EPA is primarily concerned with dermal exposures during manufacture and processing, as well as inhalation by workers during processing.

The effective date of the Testing Consent Order was February 24, 1989. For further information, contact Michael M. Stahl, Director, TSCA Assistance Office, (TS-799), Office of Toxic Substances, U.S. EPA, Room EB-44, 401 M Street, S.W., Washington, D.C. 20460, (202) 554-1404.

Food and Drug Administration Approves Use of Thermal Stabilizer for Vinyl Chloride Polymers—The Food and Drug Administration (FDA) has changed its regulations to allow for the safe use of a mixture of:

dodecyltin S, S',S"-tris (isooctylmercaptoacetate), and
di(n-dodecyl)tin S,S'-di(isooctylmercaptoacetate)

as thermal stabilizers in vinyl chloride homopolymers and copolymers intended for use in contact with food. See 54 Federal Register 6657 (February 14, 1989).

The action was in response to a petition filed by the Sherex Chemical Co., Inc. The amendment was effective February 14, 1989. Written objections and requests for hearings were due by March 16, 1989 to Dockets Management Branch, (HFA-305), Food and Drug Administration, Room 4-62, 5600 Fishers Lane, Rockville, MD 20857. For further information, contact Vir Anand, Center for Food Safety and Applied Nutrition, (HFF-335), Food and Drug Administration, 200 C Street, S.W., Washington, D.C., 20204, (202) 472-5690.

EPA Extends Deadlines for CAIR—EPA has extended all Comprehensive Assessment Information Rule (CAIR) notification and reporting deadlines by 30 days. This is for all 19 substances listed under the CAIR. See the February 1989 issue of FSCT *Regulatory Update* for more information. See 54 Federal Register 6918 (February 15, 1989).

This action was in response to requests for a 60-day extension of the CAIR deadlines, by the National Paint and Coatings Association (NPCA) and The Society of the Plastics Industry (SPI). Individual companies may request a reasonable extension beyond these new deadlines on a substance-by-substance basis through mechanisms set forth in the CAIR. See 53 Federal Register 51698 (December 22, 1988).

For further information, contact Michael M. Stahl, Director, TSCA Assistance Office, (TS-799), Office of Toxic Substances, U.S. EPA, Room EB-44, 401 M Street, S.W., Washington, D.C. 20460, (202) 554-1404.

SUMMARY CALENDAR OF REGULATORY ACTIONS

February 21, 1989	FDA allows use of ethylene-vinyl acetate copolymers. (See this issue.)
February 24, 1989	EPA signs testing order for diisodecyl phenyl phosphite (PDDP). (See this issue.)
February 27, 1989	EPA re-schedules multi-source leachate from hazardous wastes to third-third schedule with land ban delayed no later than May 1990. (See this issue.)
April 13, 1989	Comments due on EPA deferral of regulation of sodium hydroxide as potential toxic air pollutant. (See March issue.)
April 14, 1989	Comments due on National Toxicology Program's proposed additions to list of carcinogens. (See this issue.)
April 18, 1989	Comments due on EPA proposal to delete sodium sulfate (solution) from Community Right-to-Know requirements. (See this issue.)
April 26, 1989	Comments due on EPA new Waste Minimization Policy (Pollution Prevention Policy). (See March issue.)
June 30, 1989	EPA extends date until mandatory use of new manifest form and OMB burden disclosure statement will begin to be required. (See this issue.).

U.S. Water-Borne Coatings Report Available

Chemark, Cincinnati, OH, has released a newly completed study of the U.S. market for water-borne coatings. The report covers industrial uses of emulsion, water soluble, and colloidal dispersion systems.

According to the report, the 1987 market for water-borne coatings was about 100 million liquid gallons, worth nearly $500 million. Dry gallons amounted to 44 million.

The use of water-borne coatings is growing almost twice as fast as the overall industrial coatings market. One important reason for this growth rate is the environmental and worker safety and health issue.

Safety and health issues support the use of water based coatings, but there are other safe alternatives to water-bornes cited in the study. These alternatives include high solids, solvent-based systems, and powder coatings. The cost/performance of a water-borne system versus competing technologies is the key criterion for acceptance.

Acrylic resins are by far the most popular type used in water-based industrial coatings, representing over ⅓ of the dry gallons used in 1987. Epoxy and vinyl are the next most often used at about ⅕ of the market each.

Water-borne coatings dominate four of the industrial market segments in which they are used. These four markets—wood composition/flat stock, vehicle primers, beverage cans, and paper/paperboard—together used over 50% of the water-borne coatings consumed in 1987.

The report concludes with a discussion of fast-growing applications for water-borne coatings, including flexible plastic coatings, vehicle OEM topcoats and other finishes, and concrete and roof coatings.

For more information on this report, contact Chemark, 9916 Carver Rd., Ste. 103, Cincinnati, OH 45242.

Witco Corp. Announces Carbon Black Expansion

Witco Corp., New York, NY, has announced plans for an expansion by approximately 50% of its Ponca City, OK, carbon black production facility. The new 75 MM pound production unit will increase the plant's capacity to 235 MM pounds. This project, along with debottlenecking projects completed or currently in progress at other plant locations, will increase Witco's total carbon black capacity to more than 435 MM pounds per year.

The new unit will be based on state-of-the-art technology developed by Witco's Concarb Division. The plant is designed to provide a series of tread grade carbon blacks which will meet the current and future needs of the rubber industry. The Concarb Division also operates carbon black facilities in Phenix City, AL, and Sunray, TX, as well as a jointly owned plant in Sydney, Australia.

Exxon to Build Plant in Port Allen, LA

Exxon Company U.S.A., Baton Rouge, LA, will build a $45.4 million plant on 60 acres of land across the Mississippi River from Exxon's Baton Rouge Refinery in Port Allen, LA, to blend, package, warehouse, and ship finished lubricants. Work on the new plant is scheduled to begin early in 1989, with completion in mid-1990. The plant will have a permanent work force of about 100 persons.

When completed, the new site will have the capacity to produce 80 million gallons per year of lubricating and process oils. Automotive engine oils, including Exxon SUPERFLO®, will be blended and packaged, as well as hydraulic oils, compressor lubricants, gear oils, automatic transmission fluids, and marine lubricants. Also to be shipped from this state-of-the-art facility are process oils, which are integral to the manufacture of such items as tires, adhesives, printing inks, furniture polish, paper products, hand cleaners, leather goods, and textiles.

Production Begins at SCM Chem.'s Australia Plant

SCM Chemicals, a unit of Hanson Industries, New York, NY, has begun production at its expanded and converted Western Australia titanium dioxide (TiO_2) operations.

This expansion, undertaken at a cost of $150 million (Australian), involved the building of new and environmentally advanced chloride process production facilities, together with supporting chlo-alkali and air separation plants, at a site nine miles north of the company's present plant site near Bunbury. The capacity of the new TiO_2 plant is 77,000 short tons per year. In addition, the company will continue to operate its existing 40,000 tons per year sulfate process plant until late 1990.

Product finishing, shipping, R&D, and administrative facilities will remain at the existing site near Bunbury.

Participants Needed for ASTM Task Group

Participants are needed for an ASTM task group on exploratory analytical research of paints. The task group is sponsored by D01.21 on Chemical Analysis of Paints and Paint Materials, a subcommittee of ASTM standards-writing Committee D-1 on Paint and Related Coatings and Materials.

The task group's purpose is to explore the need and feasibility of new methods of analysis of paint. Current work includes methods for free formaldehyde and acid catalysts. New task groups on ion chromatography for electrocoats and infrared microscopy for defect characterization have been formed as a result of this activity. Proposals for new work are invited.

All interested parties are welcome to participate. The next meeting of the subcommittee is during the June 25-28, 1989, standards development meetings of Committee D-1 in St. Louis, MO. For more information, contact William C. Golton, Du Pont Co., P.O. Box 3886, Philadelphia, PA 19146, or David Bradley, ASTM, 1916 Race St., Philadelphia, PA 19103.

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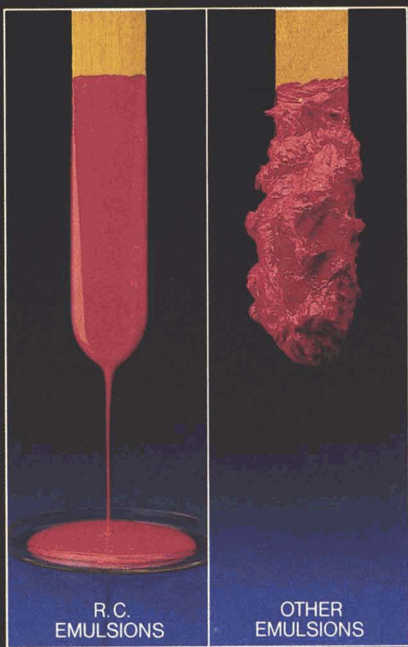

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Unocal Chem. Div. to Expand Two of Its Polymer Plants

The LaMirada, CA, and Lemont, IL, polymer plants of Unocal Chemicals Division, Schaumburg, IL, will undergo expansions. The expansion of these two facilities is the first phase in the replacement of production capability lost in the explosion and fire at the company's Bridgeview, IL, facility last July.

LaMirada facility expansion is expected to be completed by June, 1989. It will enable that facility to begin production of the firm's styrene acrylate polymers used in the coatings industry. Expansion plans call for the recommissioning of an existing reactor and the addition of support vessels, product and handling storage, automatic control systems, and loading facilities.

Porter International Formed

The Protective Coatings Divisions of Porter Paint Co. and International Paint Co. (USA) have merged, forming Porter International. The new protective coatings company, which will be headquartered in Louisville, KY, will combine products, manufacturing, distribution, sales and support personnel, and technical resources of the two former companies. Among the industries to be served by the new company are petroleum, chemical processing, pulp and paper, and steel fabrication.

Porter Paint Co.'s Trade Sales Division, which includes over 550 Porter-identified outlets, will not be affected by the merger. International Paint Co.'s Marine Coatings and Interlux® Yacht Finishes Division will likewise remain unaffected.

Reichhold Announces Modernization Program

The Emulsion Polymers Division of Reichhold Chemicals, Inc., has announced a long-term modernization program for its latex production units. The plan, expected to be completed in 1991, involves investment of approximately $30 million for additional automation, production debottlenecking, and improvements to distribution and scaleup facilities. At the conclusion of this investment program, Reichhold's latex production capacity will have been increased by 15%.

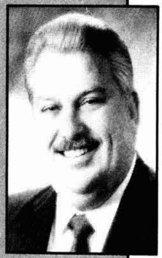
As part of this manufacturing plan, the company will close its polyvinyl acetate plant in Charlotte, NC, effective April 1, 1989.

The Emulsion Division, headquartered in Dover, DE, produces aqueous emulsion polymers, dry plastic additives, and solution acrylic polymers for the coatings, paper, textile, building products, plastics, and specialty intermediate markets.

Theodore Provder Is Named Recipient of 1989 Roy W. Tess Award by ACS

The officers and Award Committee of the Division of Polymeric Materials: Science and Engineering (PMSE) of the American Chemical Society have announced that the recipient of the 1989 Roy W. Tess Award in Coatings is Dr. Theodore Provder of the Glidden Company, a subsidiary of ICI Paints.

This award, established to recognize outstanding contributions in the fields of coatings science, technology and engineering, is given to Dr. Provder in acknowledgment of his significant achievements in a variety of areas, including particle size distribution analysis, size exclusion chromatography, polymer and coatings characterization, the chemistry and physics of cure, and the application of computer technology to R&D modelling. Through over 80 journal publications and three patents, he has firmly established his reputation as a seminal thinker in the fields of coatings science and technology, and the body of work which he has created over the length of his distinguished career has established him as a key innovator in the industry.



Dr. Provder, who was graduated from the University of Miami and received his doctorate in Physical Chemistry from the University of Wisconsin at Madison, was the 1987 Mattiello Lecturer at the Annual Meeting of the Federation of Societies for Coatings Technology, and is the Past-Chairman of the Polymeric Materials: Science and Engineering Division (PMSE) of the American Chemical Society. In 1983, he was named Principal Scientist of The Glidden Company, and received Glidden's "Scientific and Technical Achievement" Award in 1977, and the "Award for Technical Excellence" in 1981 and again in 1987.

Dr. Provder is an internationally-known lecturer, and has chaired numerous national scientific meetings, resulting in his six edited books.

Dr. Provder will be presented the Tess Award at the 198th Meeting of the ACS, September 10-15, 1989, in Miami Beach, where both a symposium and a reception, co-sponsored by the Shell Development Company and The Glidden Company, will be held in his honor.

Manville Corp. to Purchase Koppers' Phenolic Foam Business

Manville Sales Corporation, Denver, CO, has acquired certain assets of the phenolic foam insulation business from Koppers Co., Inc., of Pittsburgh, PA. Under the agreement, Manville will own the exclusive right to use Koppers' phenolic foam technology in the United States. In addition, the firm will acquire Kopper's production facilities in Oak Creek, WI, and Kopper's partnership interest in MA-KO Insulations Co. In 1987, Manville announced the formation of MA-KO, a joint venture company with Koppers to manufacture phenolic foam insulation products for use in industrial and commerical roofing and other applications.

The acquisition involves an expenditure in excess of $23 million. Manville also plans construction of a second phenolic foam plant to be located in the eastern U.S. in late 1989.

JB Chemicals Forms New Division

Jack R. Benham, F.A.I.C., of JB Chemicals Coatings and Consulting, Pembroke Pines, FL, has accounced that a new division, L B Containment Division, will be a distributor for the Containment Corp. of Las Alamitos, CA. The new division, headed by Phil Licari, will also be headquartered in Pembroke Pines, and will service a territory which includes Florida, Alabama, Georgia, South Carolina, and Tennessee. Mr. Benham is a member of the Southern Society for Coatings Technology.

Five Operating Divisions Added to BASF Corp.

The creation of five new operating divisions within the BASF Corp., Parsipanny, NJ, has been announced. Each of the five units will be headed by an Executive Vice President.

The divisions will be:

• Fibers Division, headed by R. Wayne Godwin, will take on responsibility for textile dyes and chemicals plus polymer dispersion in addition to the existing businesses: textile fibers, carpet fibers, and industrial fibers.

• Consumer Product & Life Science Division, under the direction of Manfred Hopp, will combine the corporation's businesses in flavors, fragrances, vitamins, agricultural chemicals, pharmaceuticals, performance chemicals, as well as the firm's audio, video, and EDP magnetic media lines.

• Coatings & Colorants Division, managed by J. Larry Jameson, will be responsible for automotive and container coatings, printing inks, colorants, and process chemicals.

• Polymers Division, headed by Manfred Buller, will bring together the engineering plastics resins activities, the urethane and styrenic polymer foams businesses, as well as advanced composites from BASF structural materials.

• Chemicals Division, managed by Peter R. Heinze, combines chemical intermediates, industrial organics, and fiber raw materials, in addition to BASF's North American interests in oil, gas, and basic petrochemicals.

F.W. Bernthal, Vice Chairman and Chief Financial & Administrative Officer, will continue to be responsible for all functional and support activities in North America as head of the Corporate Finance and Services Division.

The new organization will allow each operating division to concentrate on servicing its market segment with responsibility for the business from R&D through manufacturing to marketing and sales.

Battelle Initiates Program To Focus on "Technology Watching"

Battelle, Columbus, OH, has introduced a new multiclient program designed to help clients stay abreast of technology developments and put related information to profitable use. Called "Mastering New Technologies," the program focuses on "technology watching"—collecting current, reliable information on emerging technologies and their impact, and "internalizing"—effectively using results of the watching.

Subscribers to the program, which is open to new participants, include companies and other organizations for which technology is a key factor for success. Program elements will include information on Battelle's current knowledge of technology watching; the results of a survey of 15 nonsubscriber companies; and individual subscriber meetings during which Battelle will answer questions and make practical recommendations.

For additional information, contact Michael P. Manahan, Battelle, 505 King Ave., Columbus, OH 43201.

Witco to Build Stearate Plant in Houston

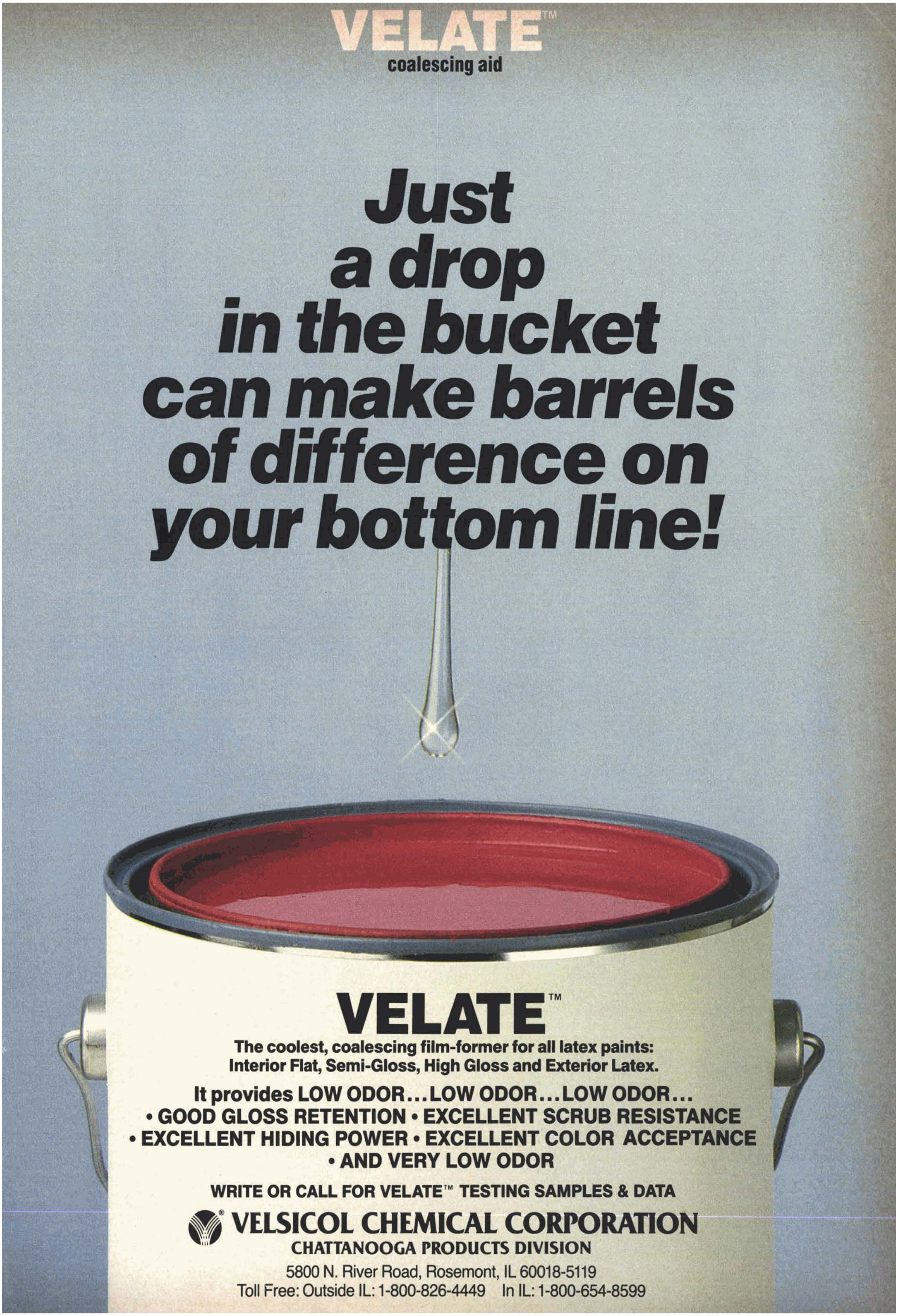
Witco Corp., New York, NY, has announced plans for the construction of a $6 million plant to produce stearates. The state-of-the-art manufacturing facility will be built on the company's Houston, TX, property alongside an existing surfactants plant. Both plants will be operated by the firm's Organics Division.

Witco operates four other stearate plants located in Clearing (Chicago), IL; Perth Amboy, NJ; Oakville, Canada; and Cuautitlan, Mexico. Start-up of the new facility is expected by the summer of 1990.

Cabot Stains Relocates To Newburyport, MA

Samuel Cabot Inc. has moved its management offices from Boston to its new manufacturing facility in Newburyport, MA. The relocation, which took place in late November, is the final step in a major corporate move to centralize administration, sales, marketing, and manufacturing under one roof.

Cabot's management had been headquartered in downtown Boston for many years at a site adjacent to two of the city's most popular landmarks—the Faneuil Hall Marketplace and City Hall Plaza.



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Heating of the Cathode During The Electrodeposition of Cationic Primers

D.M. Dražić
University of Belgrade*

N.M. Aćamović and O.D. Stojanović
Zastava Laboratory

The results of measuring the surface temperature in the center of a cathode during the deposition of a cationic primer are presented. The measurements were done by means of a Chromel-Alumel thermocouple spot welded to the center of the cathode. It is shown that the cathode reaches 90°C during the deposition of the cationic primer, the temperature being determined primarily by the deposition voltage and the properties of the metal substrate. The reasons for the heating of the metal surface are discussed. During the deposition on the zinc electroplated steel, the dielectric failure of the wet film was observed.

INTRODUCTION

Cathodic electrodeposition of primers has become the most widely used process for improving corrosion protection in the automotive industry. The baths for the deposition of cationic primers contain 15-20% of the dispersed pigment and a positively charged resin adsorbed in micellar form on the pigment particles.[1,2] The cationic resins contain $-NH_2$ groups which can be converted to a water soluble form, $-RNH_3^+$, by partial neutralization.[3] The deposition of the cationic primers occurs when the electrophoretically-migrated positively-charged resin and pigment micelles react in the near-the-cathode layer with OH^- ions formed by water electrolysis on the cathode.

At a constant deposition voltage, due to the formation of a nonconducting primer layer, the deposition current decreases with time, while the cell resistivity, assuming the validity of Ohm's law, should follow the relation

$$R = \frac{U}{I(t)} = \rho' \int_0^t I dt + R_b \tag{1}$$

where U is the deposition voltage, ρ' the resistivity of the film deposited by one coulomb, and R_b the resistivity of the bath.[1]

In the ideal case, the deposition of homogeneous, smooth, very adherent films should be expected. In practice, non-ideal films are often obtained. Beck[1] assumed that, among others, one of the reasons is the electric heating of the film during the deposition. Heat, N_F, evolved inside a film having resistivity, R_F, at a constant deposition voltage, U, is given[1] by the relation

$$N_F = I^2 R_F = \frac{R_F}{(R_F + R_b)^2} \cdot U^2 \tag{2}$$

Therefore, one can conclude that the heat evolution increases with the square of the deposition voltage and reaches a maximum when the film and bath resistivities become equal. On the other hand, the maximum temperature in the center of the cathode depends on the heat capacity of the metal substrate, and the heat transport rate through the film and the near-the-cathode layer.

Papers dealing with the deposition of non-ideal films, especially the heating of the cathode, are scarce in literature.[1,3] Therefore, we undertook a study of the heat evolution during the deposition of cationic primers on several substrates by measuring the temperature at the center of the cathodes during the deposition process at different deposition voltages and bath pH.

EXPERIMENTAL

The deposition of the cationic primers was carried out with a bath made of a two-component cataphoretic material (paste and emulsion) ED 3002 with a binding material based on epoxy resin modified by an isocyanate component. The deposition was done at a constant deposition voltage from a 3 dm^3 bath volume on four different substrates: steel ($FEPO_4$), phosphatized steel (Fostone

*Faculty of Technology and Metallurgy, Karnegijeva 4, P.O. Box 494, 11001 Belgrade, Yugoslavia.

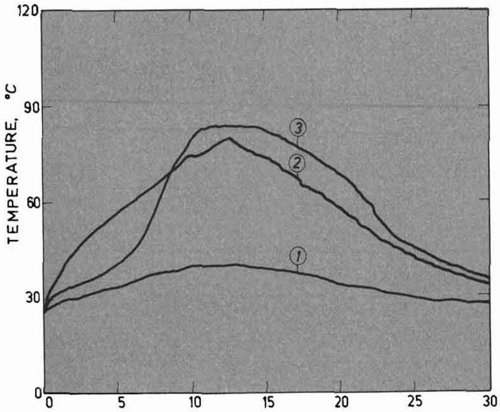

Figure 1—Influence of the cationic primer deposition voltage on the cathode heating as a function of time: 1—250 V; 2—300 V; and 3—350 V

301), phosphatized zinc electroplated steel (Fostone 36), and zinc electroplated steel.

The cathode coupons cut out of the corresponding steel sheet samples had 130 cm^2 of surface while the stainless steel anode had 100 cm^2. The bath was moderately stirred by mechanical means. The bath properties were as follows: binder contents—15.2%; pigment contents—5.1%; pH = 6.22; and conductivity at 20°C—1050 $\mu S\ cm^{-1}$, 25°C.

Temperature at the surface in the center of the cathode was measured by a Chromel-Alumel thermocouple spot welded to the metal surface. The thermocouple voltage was recorded during the experiment on a mV-time recorder. The thermocouple was previously calibrated in hot water in the 25-100°C range. The calibration line was linear with a 33 $\mu V/°C$ slope.

RESULTS AND DISCUSSION

Influence of the Deposition Voltage

The temperature changes of the cathode made of phosphatized steel during the deposition of the primer at different deposition voltages are shown in *Figure* 1. As seen, the temperatures increase and reach maximum values after 10-15 sec. The values of these maxima increase with an increase in the deposition voltage, e.g., t_{max} is 41°C at 250 V, 78°C at 300 V, and 84°C at 350 V. The characteristic bell shape of the temperature vs time curves can be explained by bearing in mind equation (2) and the kinetics of the primer film formation.[3] Namely, during the first 10-15 sec the film thickness increases to its final value of 30-35 μm, which increases R_F, and hence the heat evolution and temperature.

Furthermore, the electro-osmotic pumping out of water from the layer pores increases R_F so much over R_b that the deposition current and the evolved heat become negligible.

Influence of the Substrate

The changes of the cathode temperature at a constant deposition voltage of 300 V for different substrates are shown in *Figure* 2. As seen, the substrates also influence the cathode temperature during the deposition process.

The highest was the temperature of the phosphatized steel (curve 2), and the lowest was of the nonphosphatized steel (curve 1). Similarly, the phosphatized zinc electroplated steel (curve 4) cathode reached a somewhat higher temperature than the nonphosphatized zinc electroplated steel (curve 3). However, curve 3 for the zinc

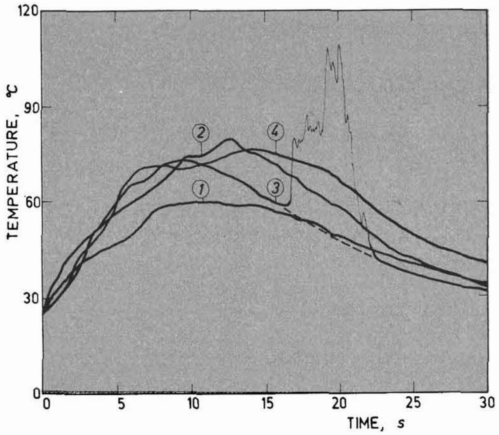

Figure 2—Temperatures of the centers of cathodes during primer deposition on steel sheet (1), phosphatized steel sheet (2), zinc electroplated steel sheet (3), and phosphatized zinc electroplated steel sheet (4). U = 300 V

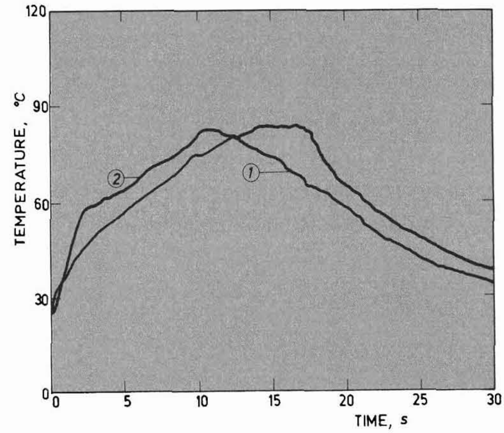

Figure 3—Temperatures of the centers of cathodes during primer deposition on steel sheet from baths of different pH: 1—pH 6.3; and 2—pH 5.8. U = 300 V

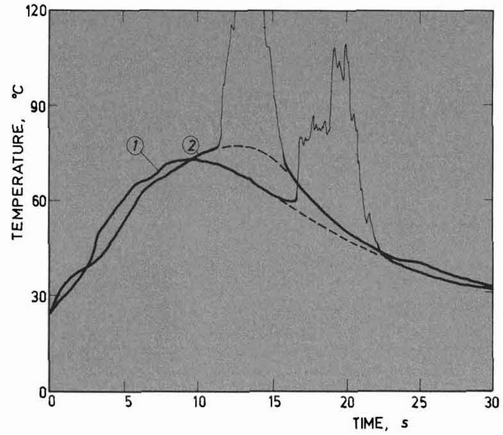

Figure 4—Temperatures of the centers of cathodes during primer deposition on zinc electroplated steel sheet from baths of different pH: 1—pH 6.3; and 2—pH 5.8. U = 300 V

electroplated steel showed some erratic changes in temperature after about 15 sec of deposition. This effect was only observed when the substrate was nonphosphatized zinc coated steel (see *Figure* 4). It is interesting to note that one can hear the characteristic noise of the electric discharge from the cell when the recorder pen starts its erratic movement. This can be related to the phenomenon of the dielectric failure of the wet film, manifested as the flashes observed in some cases by Schoff and Chen,[3] and is also believed to be one of the main reasons for cratering of the film. The fact that this phenomenon is observed only when the free zinc surface is in contact with the deposited primer film led us to believe that this is connected with the attack of high pH (about 12[4]) on zinc and its dissolution, the increase of the Zn^{2+} ion concentration inside the pores with the local decrease of the resistivity, and the enormous local increase of the current, i.e., dielectric breakdown. Of course, the brief high current flows manifest themselves as corresponding brief temperature jumps, as observed experimentally.

One can use the observed phenomenon in practice when adjusting the primer deposition parameters in a deposition plant to avoid the cratering of the film by electric discharges.

Influence of pH

The effects of bath pH changes on cathode heating at 300 V for phosphatized steel are shown in *Figure* 3 and for zinc electroplated steel in *Figure* 4. As can be seen, the difference in the bath pH had practically no effect on the cathode temperature. However, as shown in *Figure* 4, the dielectric breakdown occurred for both pH, but earlier at the lower pH, probably because of the higher conductivity of such a solution.

CONCLUSION

Measurements of the cathode temperature showed that, during the electrodeposition of the cationic primers, the temperature of the cathode increased more as the deposition voltage became higher. Some influence of the type of substrate on the cathode temperature was observed, but both pH changes did not have any noticeable effect. When the substrate was unprotected zinc plated steel, the dielectric breakdowns manifested themselves as erratic temperature fluctuations.

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Applications for Acetoacetyl Chemistry in Thermoset Coatings

F. Del Rector, W.W. Blount, and D.R. Leonard
Eastman Chemical Products, Inc.*

Acetoacetyl functionality can be incorporated into different classes of resins and used in the preparation of thermoset coatings through a variety of crosslinking mechanisms. Acetoacetyl-functional acrylic resins were prepared using new methacrylic monomer, acetoacetoxyethyl methacrylate, and polyester resins were acetoacetylated by transesterification with ethyl acetoacetate. The acetoacetyl functionality reduced solution viscosity and glass transition temperature. Thermoset coatings were prepared from the acetoacetylated acrylic polymers using conventional melamine and isocyanate crosslinking agents and found to have performance properties similar to corresponding hydroxyl-bearing resins. Several other potential crosslinking reactions are also discussed.

INTRODUCTION

One of the keys to formulating successful thermoset coatings is the selection of a crosslinking mechanism. Early coatings utilized oxygen to crosslink alkyd resins that contained unsaturation. Coatings with improved performance have been developed using melamine and isocyanate crosslinkers. Further advances in coating technology will depend, in part, upon new developments in crosslinking mechanisms. The acetoacetyl group represents one approach for expanding the formulator's choice of crosslinking systems.

The acetoacetyl group, as shown in *Figure* 1, is not new to the coatings industry. It has been known in the literature for many years,[1] but has not been utilized to a great extent because of the difficulty of incorporating this functionality onto the polymer chain. New products and synthesis techniques are now available which make the use of acetoacetyl functionality commercially viable.

The major value of the acetoacetyl group is the versatility it provides resin formulators in choosing a crosslinking mechanism. This versatility results from the presence of two sites available for crosslinking reactions. These sites are the active methylene group and the ketone carbonyl group. This paper addresses several crosslinking mechanisms at these sites, along with resins properties and coatings performance.

REACTIONS OF THE ACETOACETYL GROUP

There are many known reactions of the acetoacetyl group which can be used either to derivatize an acetoacetyl polymer or in a crosslinking mechanism. Some of these mechanisms involve conventional melamine and isocyanate crosslinkers. Other more novel systems include ambient temperature mechanisms, such as reaction with aldehydes and diamines, and the Michael reaction. These reactions will be discussed here along with another important reaction, the ability of the acetoacetyl group to chelate to metals. The utility of some of these reactions has been studied in detail for purposes of this paper and will be presented in later sections.

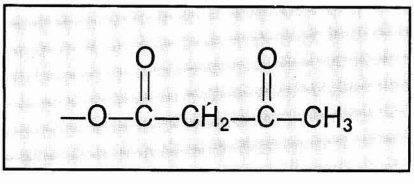


Figure 1—Acetoacetyl functionality

Presented at the 16th Water-Borne and Higher-Solids Coatings Symposium, in New Orleans, LA, on February 3, 1988. See also "A Comparison of Catalysts for Crosslinking Acetoacetylated Resins via the Michael Reaction," by R.J. Clemens and F.D. Rector, JOURNAL OF COATINGS TECHNOLOGY, *61*, No. 770 (1989).
*Kingsport, TN 37662.

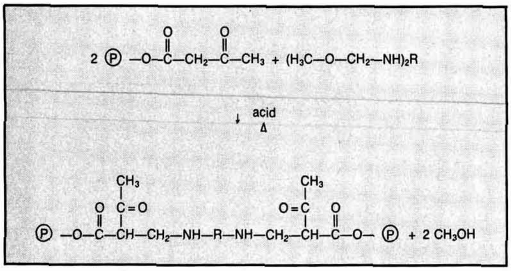


Figure 2—Reaction with melamine

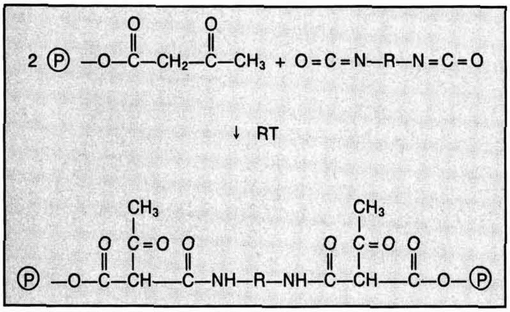


Figure 3—Reaction with isocyanate

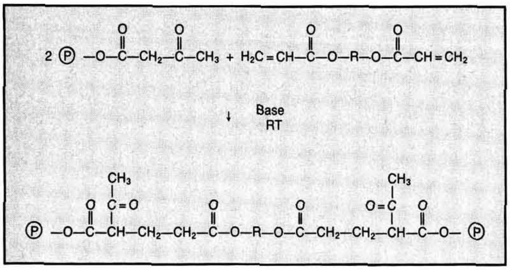


Figure 4—The Michael reaction

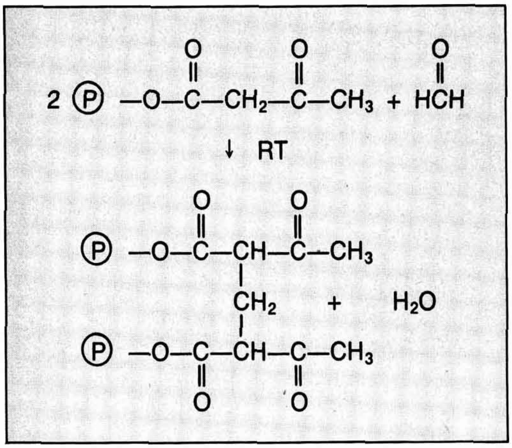


Figure 5—Reaction with aldehydes

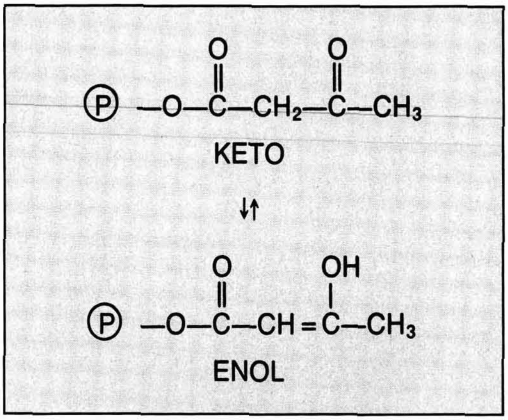


Figure 6—Keto-enol tautomerism

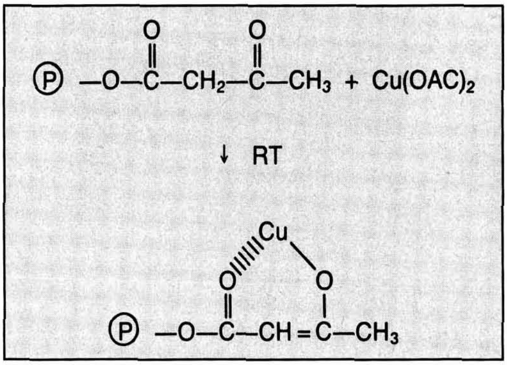


Figure 7—Chelation

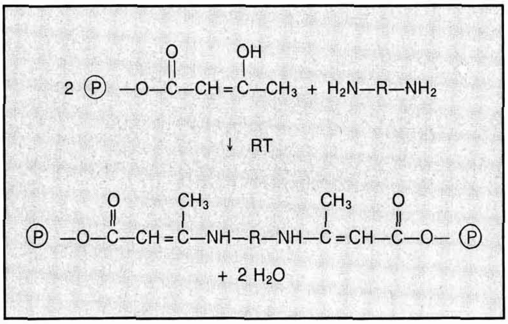


Figure 8—Reaction with diamines

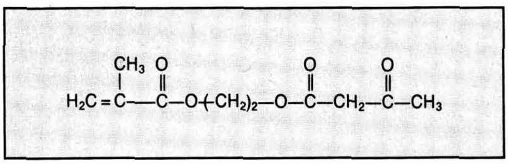


Figure 9—Acetoacetoxyethyl methacrylate (AAEM)

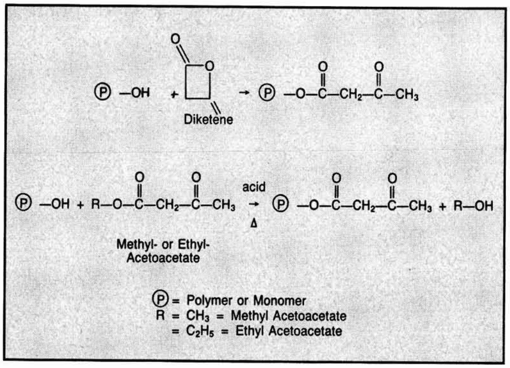


Figure 10—Mechanisms of acetoacetylation

REACTIONS OF THE ACTIVE METHYLENE GROUP

Melamines

The active methylene in the acetoacetyl functionality will react with melamines under conditions similar to the reaction of hydroxyls with melamines. The temperature required for reaction will depend on the choice of melamine. A fully methylated melamine requires a temperature of 150°C (300°F) plus an acid catalyst. The mechanism of this reaction is shown in *Figure* 2.

It should be noted that, unlike the reaction of hydroxyl-functional resins with melamines which forms an ether linkage, the reaction of the methylene group with melamines forms a carbon-carbon bond.

Isocyanates

The active methylene group will react with free isocyanates at ambient temperature and with blocked isocyanates at elevated temperature in a manner similar to the reaction of isocyanates with hydroxyls. This reaction proceeds as shown in *Figure* 3.

This reaction forms a nitrogen-carbon-carbon linkage as opposed to the typical nitrogen-carbon-oxygen urethane linkage.

The Michael Reaction

The methylene group will react at ambient temperature with electron deficient olefins, such as trimethylolpropane triacrylate (TMPTA), under basic conditions via the Michael reaction.[2] The proper choice of base catalyst can provide the combination of pot-life and cure-speed needed. The mechanism of the Michael reaction is shown in *Figure* 4.

Reaction with Aldehydes

At ambient temperature, the methylene group will react with aldehydes, especially formaldehyde. This reaction is given in *Figure* 5.

REACTIONS OF THE CARBONYL GROUP

Chelation

The acetoacetyl group exists not only in the keto form, as given in *Figure* 1, but in tautomerism with the enol form, shown in *Figure* 6. The functionality exists in both forms under normal conditions in a 75/25 keto/enol ratio.

Metal ions can chelate between the ester carbonyl and the enolic hydroxyl, as shown in *Figure* 7. This chelation has been shown to improve adhesion of the acetoacetyl-functional resins to metallic substrates.

Reaction with Diamines

The enolic hydroxyl also allows reaction at ambient temperature with amine functionality to form enamine structures as shown in *Figure* 8.

Table 1—MMA/AAEM Copolymers and Properties

Resin Reference	A	B	C	D	E	F
Mole % MMA	100	90	80	70	60	40
Mole % AAEM	0	10	20	30	40	60
Wt % AAEM	0	19.2	34.9	47.8	58.8	76.2
Mn	9585	8818	6967	7650	8930	9396
T_g, °C	105	84	57	52	44	32
Determined % solids[1]	59.0	58.8	57.7	58.0	56.4	56.4
Brookfield viscosity (cP), thousands	471	282	42	24	16	6

Table 2—MMA/HEMA Copolymers and Properties

Resin Reference	A	G	H	I	J	K
Mole % MMA	100	90	80	70	60	40
Mole % HEMA	0	10	20	30	40	60
Wt % HEMA	0	12.6	25.2	35.8	40.0	66.1
Mn	9585	6626	7611	10056	7967	9255
T_g, °C	105	59	69	58	60	—
Determined % solids[1]	59.0	62.3	60.8	63.3	63.3	*[a]
Brookfield viscosity (cP), thousands	471	1008	2016	6080	9760	*[a]

(a) Increase in resin viscosity caused resin to drop out of solution.

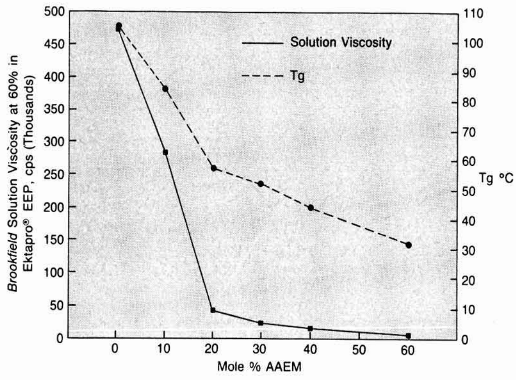


Figure 11—Effect of acetoacetyl groups on resin properties

Table 3—Cure Response Melamine Crosslinked Enamel Formulations

Mole % AAEM	20	—
Mole % HEMA	—	20
Enamel Composition, g		
Resin, 60% solids in ethyl-3-ethoxy propionate solvent	183	183
Hexamethoxymethyl melamine	18	20
TiO_2	85	87
p-TSA at 40% NV	0.6	0.6
MAK	27	27
DIBK	27	27
Ethyleneglycol monobutylether	27	27
Ethyl-3-ethoxy propionate solvent	20	92
Enamel Constants		
Pigment/binder ratio	40/60	40/60
Application viscosity by #4 Ford cup, sec	39	35
Determined % solids	50.5	45.8

EXPERIMENTAL

Synthesis of Acetoacetyl-Functional Polymers

There are several routes to the synthesis of acetoacetyl-functional polymers. Acetoacetylated acrylic resins may be prepared by using an acetoacetyl-functional monomer, such as acetoacetoxyethyl methacrylate (AAEM) (*Figure* 9). A hydroxyl-bearing resin of any type may be modified by treatment with diketene or by transesterification with methyl or ethyl acetoacetate to give acetoacetyl groups pendant to the polymer backbone (*Figure* 10).

To study the effects of the acetoacetyl group on resin properties, a series of model acrylic resins were synthesized by free radical solutions polymerization as given in *Table* 1 and the procedure presented in the Appendix. These resins were based solely on methyl methacrylate and contained increasing amounts of AAEM. A commonly used hydroxyl-bearing monomer in acrylic resins is hydroxyethyl methacrylate (HEMA). In most thermoset coatings, it is the hydroxyl group that reacts with the crosslinking agent. Therefore, for comparison with AAEM, a corresponding series of MMA/HEMA resins was prepared (*Table* 2).

The addition of the bulky, acetoacetyl group pendant to a polymer backbone would increase chain separation and reduce hydrogen bonding. These effects are consistent with the observed results of reduced solution viscosity and lower polymer T_g.

Effect on Resin Properties

The effect of acetoacetyl functionality on the properties of acrylic resins was studied by using the MMA/AAEM model resin series (*Table* 1). The graphs in *Figure* 11 show the reduction in both solution viscosity and glass transition temperature with increasing AAEM content in the copolymers.

Melamine Cure Response

The first step in evaluating the acetoacetyl group in a melamine-crosslinked enamel is to compare its rate of crosslinking with that of a typical melamine-hydroxyl reaction. This comparison was made using enamels prepared from MMA/AAEM, 80/20 and MMA/HEMA, 80/20 (Resins C and H in *Tables* 1 and 2). Formulations and characteristics of these enamels are given in *Table* 3.

These coatings were applied to test panels and a cure ladder study was carried out to compare the bake schedule required to obtain equivalent response. The criteria for acceptable cure was specified as that bake schedule which would give solvent resistance of approximately 200 MEK double rubs. The data in *Figure* 12 show that a cure schedule of 15 min at 300°F gives good solvent resistance for the hydroxyl-crosslinked system, while 30 min exposure at 300°F was required for the acetoacetyl-based crosslinker.

These results show that the acetoacetyl group will, indeed, crosslink with melamine at a temperature similar to that required for hydroxyl crosslinking but at a somewhat slower rate.

Melamine Crosslinked Enamels—Coatings Performance

In order to compare the effects of acetoacetyl vs hydroxyl crosslinking with melamine, a series of MMA/

Table 4—Melamine Crosslinked Enamel Formulations

Mole % AAEM	10	20	30	—	—	—
Mole % HEMA	—	—	—	10	20	30
Enamel Composition, g						
Resin, 60% solids in ethyl-3-ethoxy propionate solvent	190	183	167	190	183	167
Hexamethoxymethyl melamine	10	18	21	11	20	27
TiO_2	82	85	81	83	87	85
p-TSA at 40% NV	1.5	1.5	1.5	1.6	1.6	1.6
MAK	27	27	27	27	27	27
DIBK	27	27	27	27	27	27
Ethylene glycol monobutyl ether	27	27	27	27	27	27
Ethyl-3-ethoxy propionate solvent	50	20	14	95	92	137
Enamel Constants						
Pigment/binder ratio	40/60	40/60	40/60	40/60	40/60	40/60
Application viscosity by #4 Ford cup, sec	36	36	36	36	36	36
Determined % solids	47.0	48.9	49.9	45.9	45.1	42.8

Table 5—Melamine Crosslinked Enamel Properties[a]

Mole % AAEM	10	20	30	—	—	—
Mole % HEMA	—	—	—	10	20	30
Average film thickness, mil	1.0	1.0	1.0	1.0	1.0	1.0
Gloss at 60°	88	93	88	87	88	83
at 20°	71	73	66	68	71	62
Pencil hardness to mar	7H	7H	9H	7H	6H	9H
Impact resistance, in.-lb						
Direct	22	16	12	20	20	18
Reverse	2	2	2	2	2	2
Stain resistance[b]						
Iodine after 5 min	N	N	N	N	N	VS
Iodine after 30 min	S	S	M	S	M	S
Ink after 24 hr	M	M	M	M	M	M
Chemical resistance[b]						
Sulfuric acid after 1 hr	N	N	N	N	N	N
Sodium hydroxide after 1 hr	N	N	N	N	N	N
Cleveland humidity						
After 48 hr at 140°F						
% Gloss retention at 60°	99	98	97	100	99	99
at 20°	99	94	94	95	97	87
Blisters	None	None	None	None	None	None
Salt spray after 500 hr						
Blisters	None	None	None	None	None	None
Creepage from scribe, in.	<1/16	<1/16	<1/16	1/4	1/4	1/4
Weatherability						
% Gloss retention after 500 hr						
By carbon arc at 60°	81	90	54	95	90	43
at 20°	59	79	35	80	68	30
By QUV at 60°	94	92	92	97	91	98
at 20°	92	84	78	90	77	87

(a) Cure schedule: 30 min at 300°F. Substrate: 20-gauge, cold-rolled steel panels with Bonderite 37 pretreatment.
(b) Scale: N—no effect; VS—very slight effect; S—slight effect; M—moderate effect.

AAEM and MMA/HEMA resins were prepared each at 90/10, 80/20, and 70/30 molar ratios, as shown in *Tables* 1 and 2. These resins were formulated into melamine crosslinked enamels (*Table* 4) and applied to test panels for evaluation.

As previously shown, the bulky structure of the pendant acetoacetyl group lowers resin solution viscosity. This reduced resin viscosity translates into higher-solids coatings as seen in *Table* 4. The six enamels were adjusted to the same application viscosity, but increasing acetoacetyl content resulted in increasingly higher determined solids. At the same time, increased hydroxyl content gave lower determined solids.

The enamels were evaluated in a series of coatings tests as shown in *Table* 5. Since this was a model series of polymers not designed for commercial coatings use, the coatings performance was heavily influenced by the large

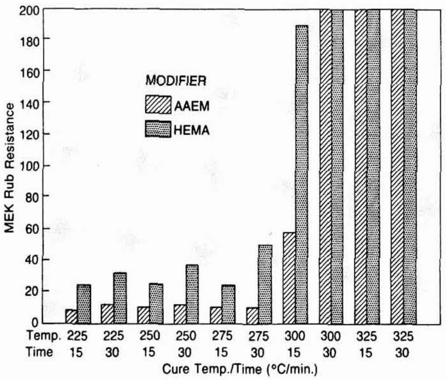


Figure 12—Cure response AAEM vs HEMA with melamine crosslinker

Table 6—Isocyanate Crosslink Pot Life

Functional Group	Acetoacetyl	Hydroxyl
Part A—Grind		
Resin at 60% NVw in ethyl-3-ethoxy propionate solvent	37.2	31.5
TiO_2	19.9	17.4
MAK	5.6	5.1
DIBK	5.6	5.1
Ethylene glycol monobutyl ether acetate	5.6	5.1
Ethyl-3-ethoxy propionate solvent	12.6	23.3
Part B—Crosslinker		
Aliphatic polyisocyanate	7.5	7.1
MAK	2.0	1.8
DIBK	2.0	1.8
Ethylene glycol monobutyl ether acetate	2.0	1.8
	100.0	100.0
Pigment/binder ratio	40/60	40/60
#4 Ford cup viscosity	30 sec	30 sec
% Solids, calculated	49.7	43.4

Table 7—Isocyanate Crosslinked Enamel Formulations

Mole % AAEM	10	20	30	—	—	—
Mole % HEMA	—	—	—	10	20	30
Enamel Composition, g						
Resin, 60% solids in ethyl-3-ethoxy propionate solvent	155	133	117	170	125	106
Blocked aliphatic polyisocyanate crosslinker	41	64	77	30	70	86
TiO_2	83	85	85	83	85	85
DBTO catalyst	0.6	0.6	0.6	0.6	0.6	0.6
MAK	27	27	27	27	27	27
DIBK	27	27	27	27	27	27
Ethylene glycol monobutyl ether acetate	27	27	27	27	27	27
Ethyl-3-ethoxy propionate solvent	—	15	15	145	92	90
Fluorocarbon flow aid	0.6	0.6	0.6	0.6	0.6	0.6
Enamel Constants						
Pigment/binder ratio	40/60	40/60	40/60	40/60	40/60	40/60
Application viscosity by #4 Ford cup, sec	28	28	28	23	25	23
Determined % solids	47.3	51.5	51.1	46.0	45.2	43.6

amount of MMA. In most of the tests, there was no significant difference between acetoacetyl and hydroxyl crosslinking with melamine. In the salt spray test, however, the acetylated resins exhibited less creepage from scribe than the hydroxyl-based series. The salt spray resistance is a function of both the corrosion resistance of the polymer and the adhesion of the coating to the substrate. The improved adhesion of the acetoacetyl-based systems is believed to result from the chelation of the acetoacetyl group to the metallic substrate.

Isocyanate Cure Response

The reaction rate of the acetoacetyl group with an isocyanate was compared to that of a hydroxyl group with isocyanate using 80/20 MMA/AAEM and MMA/HEMA resins (*Table* 1). These resins were formulated into two-component enamels and evaluated for pot life (*Table* 6).

The viscosity measurements given in *Figure* 13 show the acetoacetyl system to have a useful pot life in excess of nine hours, while the hydroxyl-based system gels with-

Table 8—Isocyanate Crosslinked Enamel Properties[a]

Mole % AAEM	10	20	30	—	—	—
Mole % HEMA	—	—	—	10	20	30
Average film thickness, mil	1.3	1.0	1.0	1.2	0.9	1.0
Gloss at 60°	97	78	84	96	89	87
at 20°	83	54	66	80	73	69
Pencil hardness to mar	8H	8H	8H	8H	8H	8H
Impact resistance, in.-lbs						
Direct	20	20	26	20	26	26
Reverse	<2	<2	<2	<2	<2	<2
MEK rub resistance						
Number passed	200+	200+	200+	200+	200+	200+
Stain resistance[b]						
Iodine after 5 min	N	N	VS	N	N	N
Iodine after 30 min	N	M	SEV	N	S	SEV
Ink after 24 hr	SEV	SEV	SEV	M	M	SEV
Chemical resistance[b]						
Sulfuric acid after 1 hr	N	N	N	N	N	N
Sodium hydroxide after 1 hr	N	N	N	N	N	N
Cleveland humidity						
After 48 hr at 140°F						
% Gloss retention at 60°	100	100	100	100	100	100
at 20°	100	100	100	100	100	100
Blisters	None	None	None	None	None	None
Salt spray after 500 hr						
Blisters	None	None	None	None	None	None
Creepage from scribe, in.	<1/16	<1/16	<1/16	<1/16	<1/16	<1/16
Weatherability						
% Gloss retention after 500 hr						
By QUV at 60°	100	100	97.6	98.9	98.9	100
at 20°	100	100	100	100	100	100

(a) Cure schedule: 30 min at 300°F. Substrate: 20-gauge, cold-rolled steel panels with Bonderite 37 pretreatment.
(b) Scale: N—no effect; VS—very slight effect; S—slight effect; M—moderate effect; SEV—severe effect.

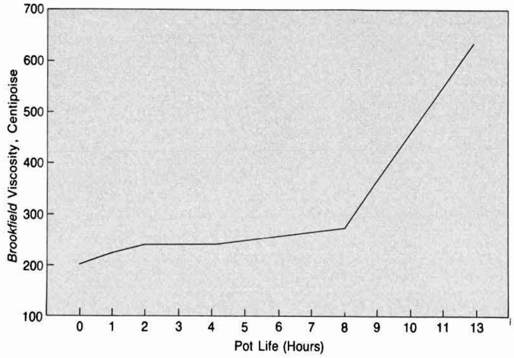


Figure 13—Acetoacetyl-isocyanate pot life ambient temperature

in the first hour. Similar studies using blocked diisocyanates showed little difference in the reactivity of the acetoacetyl vs hydroxyl group.

The results indicate that the acetoacetyl group will react with isocyanates but at a slower rate than hydroxyl groups.

Isocyanate Crosslinked Enamels—Coatings Performance

The same resins used in the crosslinking study with melamines were formulated into isocyanate crosslinked enamels, as shown in *Table* 7. The enamels were spray applied to test panels, cured, and conditioned for 24 hr at room temperature. These coatings were evaluated in the same manner as the melamine crosslinked series. The data given in *Table* 8 show no significant difference in the performance of the two systems.

CONCLUSIONS

The acetoacetyl group offers unique versatility to the formulator of thermoset coatings. This versatility stems from its ability to participate in a variety of conventional and non-conventional crosslinking mechanisms. Desirable resin properties have been obtained by adding the acetoacetyl group to the polymer chain. Attractive coatings properties also have been obtained using this group in different crosslinking mechanisms. Acetoacetyl chemistry offers the formulator greater latitude for the design of future coatings systems.

References

(1) Bader, A., U.S. Patent No. 2730517, PPG.
(2) Clemens, R.J. and Rector, F.D., "A Comparison of Catalysts for Crosslinking Acetoacetylated Resins via the Michael Reaction," JOURNAL OF COATINGS TECHNOLOGY, *61*, No. 770 (1989).

APPENDIX

Acrylic Resin Synthesis Procedure

REACTION SETUP: Four-neck round bottom flask equipped with (a) heating mantle, (b) air-driven stirrer, (c) nitrogen purge, (d) thermocouple and thermowatch electronic temperature control, (e) condenser, and (f) addition funnel.

SYNTHESIS PROCEDURE:

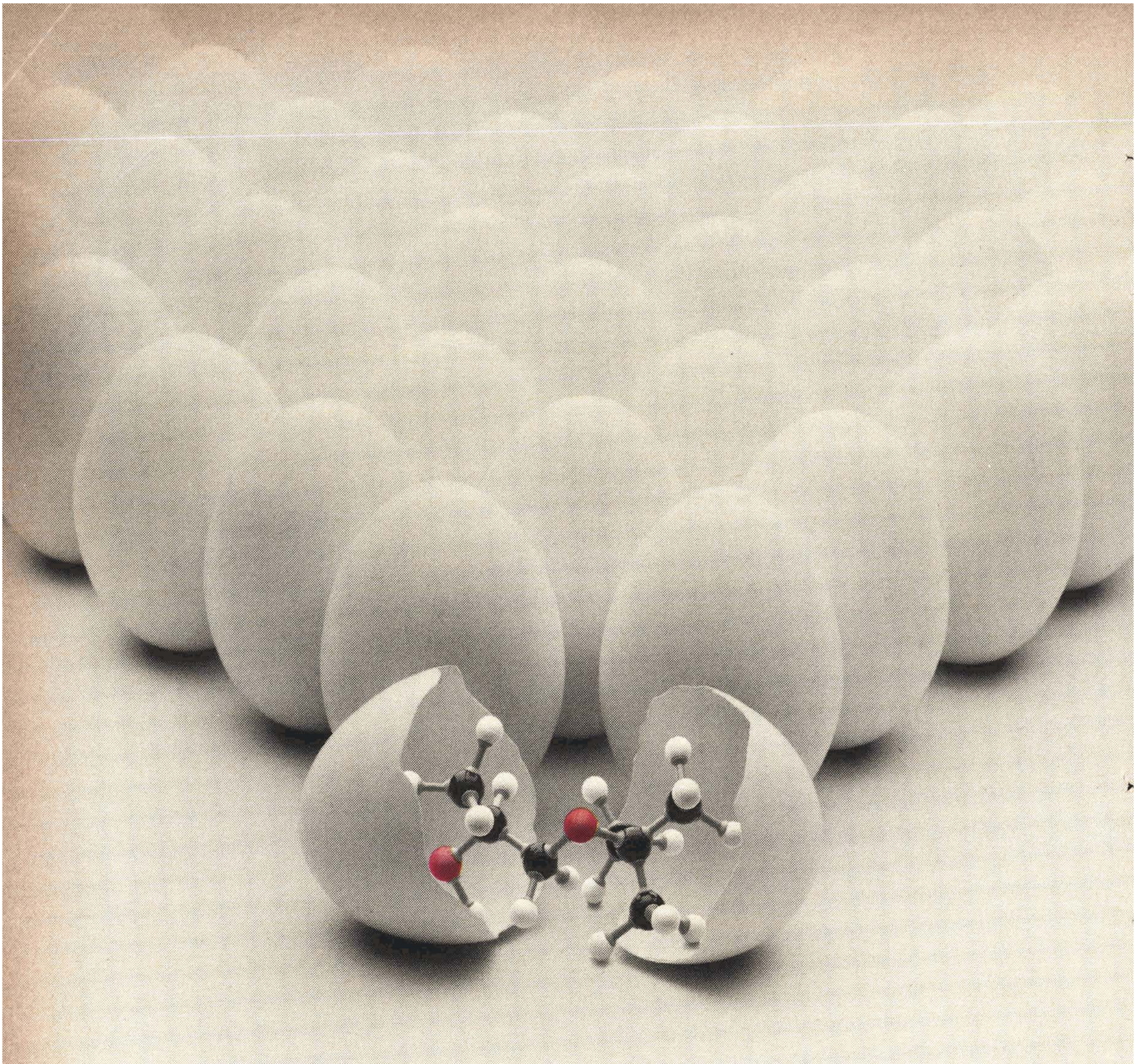
(1) Place ethyl-3-ethoxy propionate solvent in flask and heat to 100°C.

(2) Mix monomers and initiator to complete dissolution. Place mixture in addition funnel and add dropwise to heated solvent over a 4- to 4½-hr period. Initiator is 1.5 mole % Vazo 67 from Du Pont.

(3) After addition of monomer mix is completed, let reaction continue at 100°C for ½ hr.

(4) Dropwise add an additional ½ mole % initiator as a 10% solution in the ethyl-3-ethoxy propionate solvent over a 10- to 15-min period to terminate the reaction.

(5) Turn heat off and transfer resin to storage container.



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CONSTITUENT SOCIETY PAPER

Performance of Exterior Flat Finishes On Medium Density Hardboard Siding

Steve Bussjaeger and Roger E. Haines
Kansas City Society for Coatings Technology
Technical Committee

A five-year exposure study comparing the relative performance of several exterior, flat coating systems applied to a variety of commercially available hardboard sidings has demonstrated the superior performance of a two-coat, latex system on this substrate. Acrylic top coats were rated slightly higher than the acrylic terpolymer and vinyl acrylic formulations tested, exhibiting better durability in high PVC top coats and one-coat applications. This difference was much more pronounced on textured hardboard substrates.

The oil/alkyd top coats showed a higher frequency of adhesion and discoloration failures than the latex paints. One-coat, oil/alkyd house paint systems were rated as relatively poor performers.

INTRODUCTION

The Technical Committee of the Kansas City Society for Coatings Technology initiated an exposure study in March of 1981, with the objective of generating data on the weathering performance of selected exterior flat paint systems applied to hardboard siding materials. The increased use of hardboard siding for residential construction, accompanied by reports from member companies of frequent problems (discoloration, loss of adhesion) experienced when coating this substrate, were motivating factors in undertaking this investigation.

Very little documentation of previous work related to exposure studies on hardboard siding or information concerning the substrate itself was discovered. This prompted the committee to include in its research an attempt to evaluate those characteristics of the uncoated hardboard considered significant to the paint-holding properties of the substrate. Results of these tests (density, moisture absorption, moisture content, and impact resistance), as well as the data compiled after two years exposure, were reported in the April 1984 issue of the JOURNAL OF COATINGS TECHNOLOGY.[1]

This article is an update of those previously reported results and summarizes significant findings recorded at the completion of the five-year exposure.

MATERIALS AND METHODS

Detailed descriptions of the substrates and formulation constants for the primers and top coats evaluated can be found in the previously mentioned report.[1] Application procedures and coverage rates are also described. Briefly stated, five different hardboard manufacturers were included in the Kansas City study. Each manufacturer was permitted to submit test panels in any or all of three basic medium density siding categories: factory preprimed, smooth lap siding; factory preprimed, textured (embossed) siding; and unprimed textured siding.

A TT-P-25 type oil/alkyd undercoat[2] and an acrylic emulsion primer[3] were applied to separate sections of each panel. A stripe across the center of each test panel received no "field applied" primer.

Top coats were classified by resin composition (oil/alkyd, acrylic, acrylic terpolymer, and vinyl acrylic) and tested in two different colors, at three PVC levels. Seventy-two finishing systems (120 panels) were evaluated.

The panel and top coat formulations were each given an alphanumeric designation, e.g., A1-01-35, where:

(1) A-E identifies the board manufacturer.

(2) 1-4 describes the category of the substrate: 1 = preprimed smooth, 2 = unprimed textured, 3 = pre-

This paper is an update of a presentation given at the 61st Annual Meeting of the Federation of Societies for Coatings Technology, in Montreal, Que., Canada, on October 12, 1983.

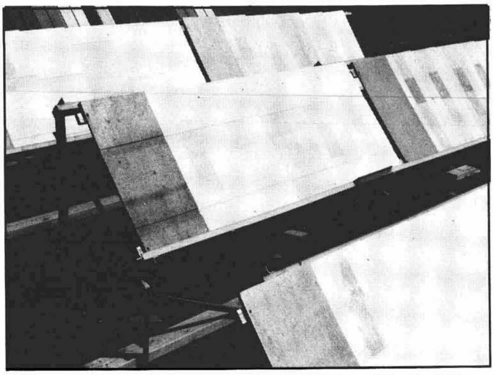

Figure 1—Exposure site in Kansas City, MO. A 45° south exposure was utilized

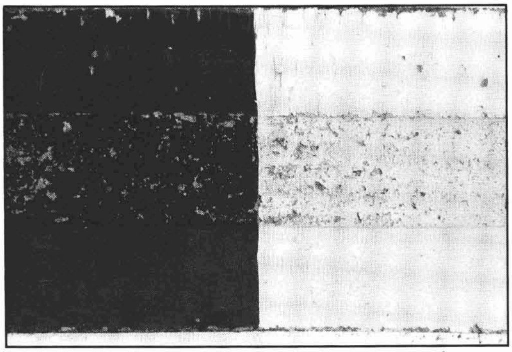

Figure 2—Panel B1-01-43 alkyd top coat showed severe cracking and peeling over unprimed middle section. Upper one-third was alkyd primed and lower one-third was latex primed

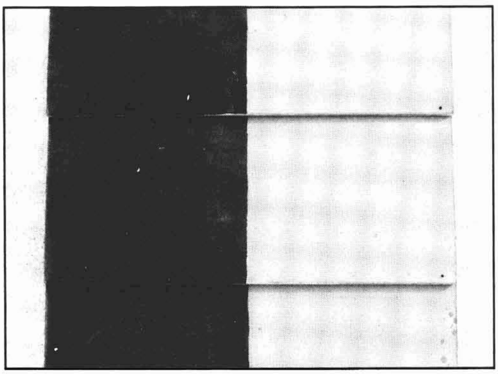

Figure 3—Panels A1-04-43, A1-03-43, and A1-02-43 (top to bottom) latex top coats all exhibited good performance

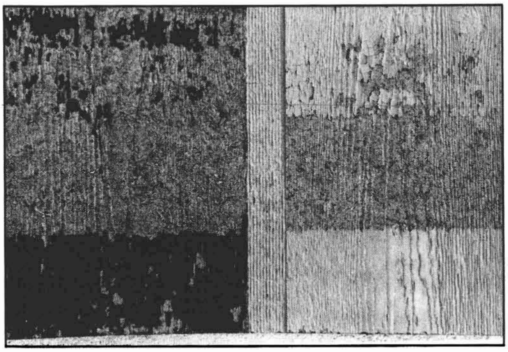

Figure 4—Panel B3-01-43 showed total loss of adhesion in one-coat system over unprimed section and severe cracking and peeling over the alkyd primed section. The lower one-third of this panel was latex primed

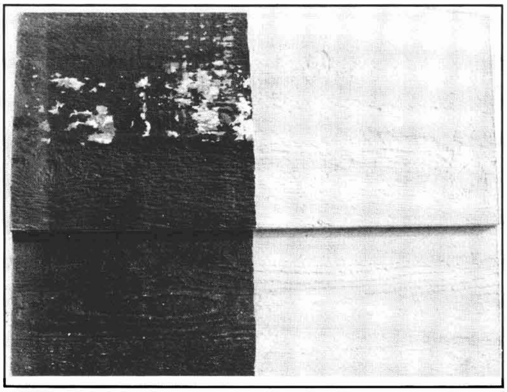

Figure 5—Panel A3-03-35 (top) acrylic terpolymer had poorer performance than A3-02-35 (bottom) acrylic latex on pre-primed textured siding

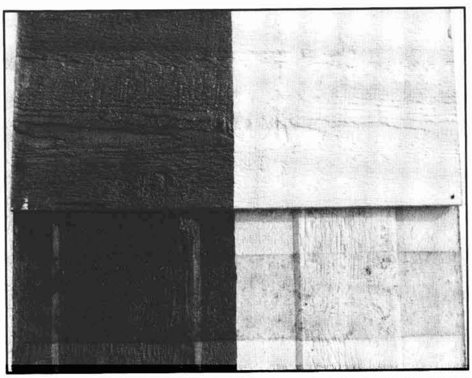

Figure 6—Panels A2-01-35 (top) and A4-01-35 (bottom) displayed discoloration, checking, and increased dirt pick-up on unprimed sections

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Roger E. Haines .... Tnemec Co., Inc.

primed textured, and 4 = unprimed decorative (formed) boards.

(3) 01-04 denotes the top coat classification: 01 = oil/alkyd, 02 = acrylic, 03 = acrylic terpolymer, and 04 = vinyl acrylic.

(4) The final two digits (35, 43, or 50) represent the percent pigment volume concentration (PVC) of the top coat.

Table 1—Criteria for Evaluating Test Coatings

Performance Criteria	ASTM Designation
Erosion	D-662-44 "Evaluating Degree of Erosion of Exterior Paints"
Checking	D-660-44 "Evaluating Degree of Checking of Exterior Paints"
Cracking	D-661-44 "Evaluating Degree of Cracking of Exterior Paints"
Flaking (adhesion loss)	D-772-47 "Evaluating Degree of Flaking (scaling) of Exterior Paints"
Discoloration	All surface contamination was numerically rated based on FSPT standards for dirt and mold accumulation.

RESULTS AND DISCUSSION

Five-year exposure results showed some extreme failures, but also revealed some excellent paint performances (*Figure* 1). The finishing systems were evaluated using the ASTM Performance Criteria listed in *Table* 1.[4] However, the differences in the numerical ratings between the two-year and five-year evaluations were not significant enough in many of the criteria to warrant reprinting *Tables* 5-8 of the earlier report.[1]

Results of the five-year study are summarized in the following paragraphs, categorized by substrate type. This information is intended to illustrate differences in the performance of the coating systems tested, and does not purport to draw conclusions concerning the quality of the hardboard substrates or their end use performance.

Factory Preprimed, Smooth Siding

Generally, all the systems tested performed much better over the smooth boards than on their textured counterparts. Most of the sections on these boards that were not field primed (one-coat systems) showed some degree of "board stress," i.e., raising of the fibers on the surface of the substrate. Only one adhesion failure was evident and very little staining or discoloration occurred. Panel B1-01-43 (one-coat, oil/alkyd) (*Figure* 2) was given the lowest overall rating in this group, showing severe cracking and some peeling on the unprimed section of the board. Cracking was also evident on the alkyd primed portion of Panel B1-01-50. No differences were noted in the performance of the acrylic, acrylic terpolymer, or vinyl acrylic copolymer top coat formulations on the primed sections of the boards (two-coat systems) (*Figure* 3).

Factory Preprimed Textured Siding

Every top coat formulation tested showed some degree of adhesion loss over the unprimed (one-coat application) section of this substrate. Ten to fifteen percent adhesion loss was recorded for the one-coat sections of Panels A3-01-35, 43, and 50 (oil/alkyd). Boards B3-01, at all PVC levels showed approximately 95% loss of adhesion in a one-coat application and severe cracking over the alkyd-primed sections of the boards (*Figure* 4). The higher PVC oil/alkyd top coats performed worse than the 35% PVC versions, and the oil/alkyd formulations in general were rated much lower than the comparable one- or two-coat systems utilizing a latex top coat.

As noted earlier, one-coat latex finishes all showed some peeling or flaking (5% or less). The one-coat acrylic, 50% PVC top coat rated higher in crack resistance than the single-coat acrylic terpolymer and vinyl acrylic systems at the same PVC (*Figure* 5). No other differences were recorded for the latex formulations.

Unprimed Textured Siding (Designations #2 and #4)

As could be expected from earlier results, one-coat systems on these boards also exhibited more performance problems than the two-coat systems. Panels A2-01 and A4-01 (oil/alkyd), at all PVC levels, had varying degrees of discoloration and checking with a single coat of paint (*Figure* 6). All D2-01 panels (one-coat) showed 5-10% loss of adhesion and/or severe cracking, depending on the PVC of the oil/alkyd top coat. The severity and frequency of these paint failures increased as the PVC of the coating

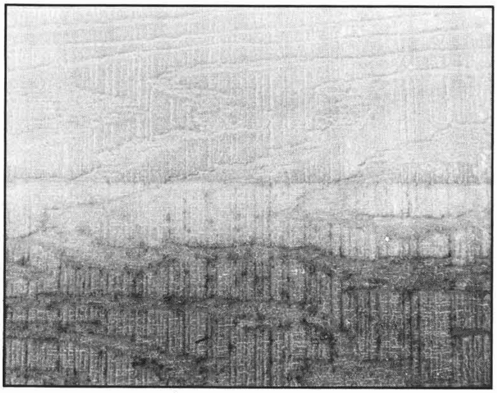

Figure 7—Panel E2-01-50 exhibited checking of oil/alkyd top coat over latex primed section (lower section). Checking was not as evident on unprimed or oil primed sections

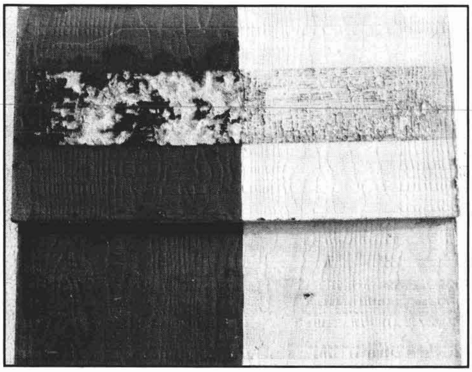

Figure 8—Panel D2-04-43 (top) vinyl acrylic showed poorer performance than D2-02-43 (bottom) acrylic on unprimed sections

increased. Some checking was also evident with a two-coat oil/alkyd system on a few boards in this category (*Figure* 7).

Panels D2-03 and D2-04 (one-coat acrylic terpolymer and vinyl acrylic) in all PVC ranges showed severe substrate disintegration. No coating was left and the exposed board had weathered badly. The acrylic formulations on the same substrate were still protecting the board (single-coat application), but cracking of the paint film was evident (*Figure* 8).

SUMMARY

After five years in a light industrial environment at 45° southern exposure, the oil/alkyd top coats in all PVC (or PVC ranges) tested showed varying degrees of failure, especially when applied in a single coat. The worst adhesion and discoloration problems occurred with the 43% and 50% PVC oil/alkyd formulations applied in one coat to textured hardboard substrates. The factory preprimed textured boards exhibited more paint loss than the unprimed textured sidings. Discoloration was more prevalent on, but not limited to, unprimed textured boards.

Overall, it can be said that as the PVC of the oil/alkyd top coat formulations increased, so did the rate and severity of the paint failures.

Where differences were noted between the three latex vehicles tested, the higher PVC, acrylic top coats demonstrated superior weathering and substrate protection versus the equivalent acrylic terpolymer and vinyl acrylic formulations. Failures with the latex top coats were evident only on the oil-primed and unprimed sections of a few textured hardboard substrates and generally were limited to the 50% PVC formulations.

The degree of flaking, cracking, and checking was more pronounced on the darker color of equal PVC top coats on both latex and oil/alkyd formulations.

ACKNOWLEDGMENTS

Special thanks are due to the members of the American Hardboard Association and the Davis Paint Company for major contributions to the successful completion of this work.

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Use of Polyacrylic Acid Electrolytes Diffused in Zinc Phosphate Conversion Coatings For the Corrosion Protection of Steel

T. Sugama, L.E. Kukacka, N. Carciello, and J.B. Warren
Brookhaven National Laboratory*

Polyacrylic acid [p(AA)], electrolyte macromolecules diffused into crystalline zinc phosphate (Zn·Ph) conversion coatings that are precipitated onto cold-rolled steel by dissolution-recrystallization processes, enhance the corrosion protection of steel. One of the specific subserviences was that, when the NaOH-dissolution of Zn·Ph is considered, the Zn-OOC electrostatic bonds at p(AA)-Zn·Ph interfaces are transformed into $Na^{+}\,{}^{-}OOC$ ionic bonds which associate with the salt complexed macromolecules. Another is the intermolecular chemical reactions between p(AA) and polymeric topcoats. These contributions relate directly to a lower cathodic delamination rate.

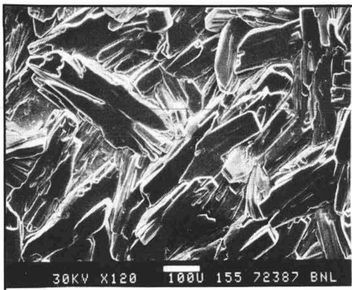
INTRODUCTION

Insoluble crystalline zinc phosphate (Zn·Ph) conversion coatings can be produced on steel surfaces by immersing the surface-cleaned steel substrate into a phosphating solution containing three components, zinc orthophosphate dihydrate [$Zn_3(PO_4)_2{\cdot}2H_2O$], H_3PO_4, and water. The major phase in the conversion coating derived from this simple phosphating solution is the same zinc phosphate dihydrate as that used in the converting solution. This suggests that the conversion to the Zn·Ph occurs through a dissolution-recrystallization process of the original $Zn_3(PO_4)_2{\cdot}2H_2O$ powders. As a result, all of the conversion coatings which are discussed in this paper were prepared using this process.

When cold-rolled steel surfaces are treated with zinc phosphating solutions containing polyelectrolyte macromolecules having proton-donating type pendant groups such as carboxylic acid or sulfonic acid, several corrosion protective benefits are accrued. The positive surface sites of phosphate crystal embryos at the beginning of the precipitation of Zn·Ph conversion coatings on the steel surface are strongly chemisorbed by the anionically charged segments of the polyelectrolytes.[1-3] This segmental chemisorption of polyanions either on newly precipitated nuclei or on growth sites during the primary crystallization processes, not only acts to array a uniformly packed fine crystal morphology brought about by the suppression and delay of the crystal growth, but also significantly improves the stiffness and ductility characteristics of the normally brittle Zn·Ph layer. Enhancement of adhesion with subsequent polymeric finishers is also obtained. The latter relates directly with the chemical bonds formed at the interface between the functional organic species such as ionic carboxylate and carboxylic acid groups existing at the outermost surface sites of the conversion coating and the polymeric topcoats.

On the other hand, Leidheiser and Sommer[4] have reported that cathodic delamination of polymeric coatings from zinc phosphated steel surfaces is due mainly to alkaline dissolution of the phosphate coating. This is caused by the hydroxyl ions generated by oxygen reduction reactions, $H_2O + 1/2\ O_2 + 2\ e^- = 2\ OH^-$, and the migration of alkali metal cations through the topcoat to the reaction zone for charge balance. Thus, it has been demonstrated that the sodium hydroxide solution dissociates a larger amount of zinc and phosphate ions from the Zn·Ph coating surfaces. Since the OH^- ions which cause delamination at paint/Zn·Ph interfaces form at pores and defects in the Zn·Ph layers, the formation of highly dense, thick, and low porosity conversion coatings should yield inherently slow oxygen reduction kinetics.

*Process Sciences Div., Dept. of Applied Science, Upton, NY 11973.



a

Formulation:

2.6% $Zn_3(PO_4)_2 \cdot 2H_2O$-5.1% H_3PO_4-92.3% H_2O

Thickness: ∿40μm

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	12072	0.39
Zn	30883	1.00
P	15830	0.51

b

Formulation:

1.3% $Zn_3(PO_4)_2 \cdot 2H_2O$-2.7% H_3PO_4-96.0% H_2O

Thickness: ∿30μm

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	18134	0.49
Zn	36843	1.00
P	20107	0.55

c

Formulation:

0.9% $Zn_3(PO_4)_2 \cdot 2H_2O$-1.8% H_3PO_4-97.3% H_2O

Thickness: ∿25μm

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	17741	0.56
Zn	31883	1.00
P	16918	0.53

Figure 1–SEM images and EDX analyses for conversion coatings derived from zinc phosphating solutions diluted with various amounts of water

Therefore, studies were conducted to explore the effects of polyacrylic acid [p(AA)] polyelectrolyte macromolecules when they are internally diffused throughout the crystalline Zn·Ph, and on the degree of the alkaline dissolution of coatings. Cathodic delamination studies for polyester-modified polyurethane (PU)-coated Zn·Ph specimens were also performed to determine the role of the intermolecular chemical reaction at PU modified Zn·Ph interfaces in reducing the delamination rates of the PU topcoat from the Zn·Ph.

EXPERIMENTAL

Materials

The metal substrate used was a high strength cold-rolled sheet steel supplied by the Bethlehem Steel Corporation. The steel contained 0.06 wt% C, 0.6 wt% Mn, 0.6 wt% Si, and 0.07 wt% P. The formulation for the zinc phosphating liquid used in this study consisted of 0.9-2.6 wt% zinc orthophosphate dihydrate, 1.8-5.1 wt% H_3PO_4, and 97.3-92.3 wt% water. These formulations were modified by incorporating a water-soluble p(AA) at concentrations ranging from 0-5.0% by weight of the total solution. The average molecular weight of the p(AA) used was 170,000.

The p(AA)-modified Zn·Ph conversion coatings were prepared in accordance with the following sequence. As the first step in the preparation, the steel surface was wiped with acetone-soaked tissues to remove any surface contamination due to mill oil. The steel was then immersed for up to 20 min in the conversion solution described at a temperature of 80°C. After immersion, the surface was rinsed with water, and then dried in an oven at 150°C for 15 min to remove any moisture from the deposited conversion film surface and to solidify the p(AA) macromolecules.

Commercial-grade polyester-modified polyurethane (PU) M313 resin, supplied by the Lord Corporation, was applied as an elastomeric topcoating. Polymerization of the PU was carried out by incorporating a 50% aromatic amino curing agent M201. The topcoat system was then cured in an oven at a temperature of 80°C.

Measurements

An image analysis was conducted of the surface microtopography and the surface chemical components of the polyelectrolyte-modified Zn·Ph coatings using AMR 100 Å scanning electron microscopy (SEM) coupled with TN-2000 energy-dispersion X-ray spectrometry (EDX).

The electrochemical testing for data on corrosion was performed with an EG&G Princeton Applied Research Model 362-1 Corrosion Measurement System. The electrolyte was a 0.5 M sodium chloride solution made from distilled water and reagent grade salt. The specimen was mounted in a holder and then inserted into an EG&G Model K47 electrochemical cell. The tests were conducted in an aerated 0.5 M NaCl solution at 25°C, and the exposed surface area of the specimens was 1.0 cm^2. The cathodic and anodic polarization curves were determined at a scan rate of 0.5 mV/sec in the corrosion potential range of -1.2-0.3 volts.

The conversion products deposited on the treated metal surfaces were identified by X-ray powder diffraction analyses. To prepare the fine powder samples, the deposited conversion layers were removed by scraping the surfaces and were then ground to a size of 325 mesh (0.044 mm).

Electron spectroscopy for chemical analysis (ESCA) was employed for identifying the chemical states and elemental compositions at the surface and interface of p(AA)-Zn·Ph composite layers. The spectrometer used was a V.G. Scientific ESCA 3 MK II. The exciting radiation was provided by a magnesium Kα X-ray source operated at a constant power of 200 W (10 kV, 20 mA). The vacuum in the analyzer chamber of the instrument was maintained at 10^{-9} Torr throughout the experiments.

The cathodic delamination tests for the PU-coated Zn·Ph specimens were conducted in an air covered 0.5M NaCl solution using an applied potential of -1.5 volts vs SCE for a period of six days. The procedure is described in reference (4). A defect was made using a drill bit with a diameter of approximately 1 mm. After exposure, the specimens were removed from the cell and allowed to dry. The PU coating was removed by cutting, and a delaminated region which appeared as a light gray area adjacent to the defect was detected.

RESULTS AND DISCUSSION

Prior to incorporating the p(AA) macromolecules into the phosphating solutions, the resulting morphological and topographical features and the major chemical compositions for Zn·Ph conversion coatings made using varying water contents while maintaining a constant weight ratio of $Zn_3(PO_4)_2{\cdot}2H_2O$ to H_3PO_4, were explored using the combined techniques of SEM with EDX. Examples of the SEM micrographs and accompanying EDX elemental analyses are shown in *Figure* 1. From the viewpoint of surface topography, the SEM image of the coating derived from the formulation containing the lowest water concentration (see *Figure* 1a) revealed an interlocking structure of 300 μm long plate-like crystals. Microscopic examination of single crystals indicated that the thickness of this conversion layer was approximately 40 μm. However, this value is only approximate because of the assumed uniform single crystals.

The dimensions of the crystals can be controlled by varying the water content while maintaining a constant $Zn_3(PO_4)_2{\cdot}2H_2O$ to H_3PO_4 ratio. As an example, increasing the water content to 97.3% produced a smaller crystal having a length of approximately 150 μm and a thickness of approximately 25 μm. This is shown in *Figure* 1c. EDX intensity count ratios of Fe to Zn elements indicated that this ratio tends to increase with decreased coating thickness. No significant changes in the P to Zn ratio were evident. Hence, thinner conversion coatings appear to contain more Fe than the thicker ones.

The effectiveness of these conversion coatings with various dimensions and Fe/Zn ratios as corrosion protective layers on cold-rolled steel was determined using electrochemical polarization behavior measurements. These tests were conducted in an aerated 0.5 M NaCl solution at 25°C. *Figure* 2 shows typical polarization curves of log current density versus potential for a plain steel (blank) and Zn·Ph-coated steels. The shape of the curves presents the transition from cathodic polarization at the onset of the most negative potential to the anodic polarization curves at the end of lower negative potential. The potential axis at the transition point from cathodic to anodic curves is normalized as the corrosion potential, E_{corr}. *Figure* 2 also indicates that all of the conversion coating specimens had an E_{corr} value of about -0.6 V and a current density of approximately 6×10^{-1} μA/cm^2 in the vicinity of E_{corr}. This seems to suggest that the protective coverage of all of these crystalline coatings is essentially the same.

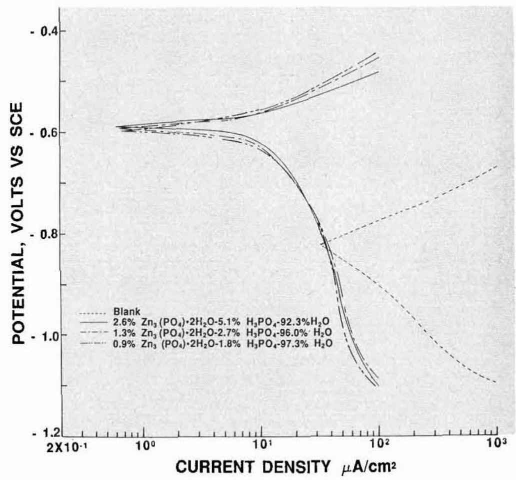
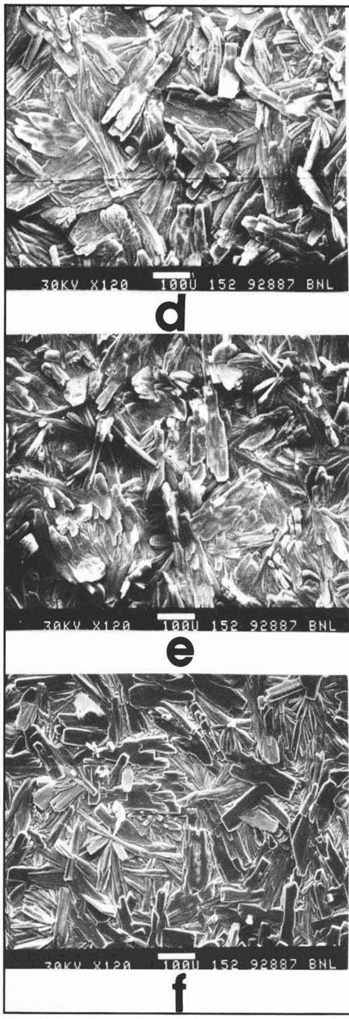


Figure 2—Comparisions of polarization curves for blank steel and steel containing conversion coatings deposited through dissolution-recrystallization processes

When compared with those for the blank steel, the striking characteristics of the cathodic curves for the coated steel specimens are as follows: (1) a large reduction in E_{corr} to less negative potentials; (2) a considerably decreased relative current density in the vicinity of E_{corr}; and (3) a lower short-term steady-state current value in the potential region between −1.1 and −1.0 V. As a result, the rate of corrosion of steel in an aerated NaCl solution is believed to be significantly decreased by the presence of the conversion coatings deposited through the dissolution-recrystallization process.

In order to investigate the ability of p(AA)-chemisorbed conversion coatings to provide corrosion protection to steel, p(AA) macromolecules at concentrations of up to 5 wt% were incorporated into a convertible solution consisting of 1.3 wt% $Zn_3(PO_4)_2 \cdot 2H_2O$, 2.7 wt% H_3PO_4, and 96.0 wt% water. *Figure* 3 shows SEM microtexture views and associated EDX data for the unmodified, and 1 and 2% p(AA)-modified conversion coatings. It is evident from comparisons of the topographical features of the crystals precipitated on the steel surfaces, that the addition of p(AA) serves to decrease the crystal size. This is due primarily to the chemisorption of p(AA) on the precipitated crystal nuclei faces at the beginning of recrystallization processes, thereby suppressing the crystal growth.[3] The accompanying EDX data indicate that the Fe/Zn ratios for the conversion coatings increase with increased p(AA) concentration. Since the only source of Fe is the steel, the extent of suppression of crystal growth by the p(AA) relates directly to the precipitation rate of iron-rich phosphate compounds. At a 5% p(AA) concentration, a further increase in the Fe/Zn ratio was obtained (*Figure* 4). The surface morphological image shows two discriminable crystal phases: one is that of a reticular crystal network (*Figure* 4–A) and the other is the plate-like crystal network (*Figure* 4–B). From the EDX quantitative evaluation, the former is associated with the Fe-rich phosphate crystalline coatings and the latter is from



P(AA): 0%

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	18134	0.49
Zn	36843	1.00
P	20107	0.55

P(AA): 1.0%

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	19068	0.56
Zn	34050	1.00
P	18387	0.54

P(AA): 2.0%

Element	Intensity Counts/100 sec.	Intensity ratio/Zn
Fe	18368	0.60
Zn	30611	1.00
P	17295	0.57

Figure 3—SEM photographs and associated EDX data for unmodified and p(AA)-modified conversion coatings

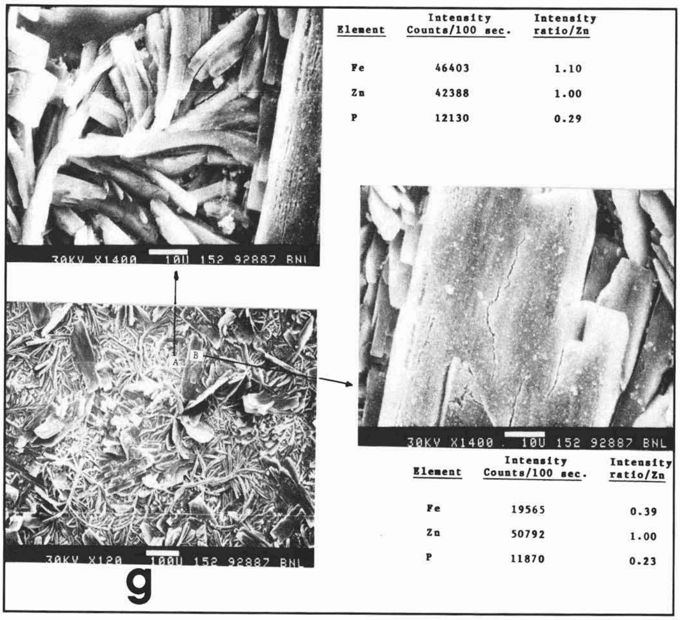


Figure 4—SEM-EDX analyses of 5% p(AA)-modified conversion coating

the Zn-rich phosphate compounds. The identification of these different phosphate phases was made using x-ray powder diffraction (XRD) with CuKα radiation at 50 KV and 16 mA.

X-ray diffraction tracings recorded in the diffraction range 0.288-0.444 nm for powdered 2% and 5% p(AA)-modified conversion coatings are given in *Figure* 5. For the 2% p(AA) samples, all of prominent spacing lines in the XRD pattern ascribe to zinc phosphate dihydrate [$Zn_3(PO_4)_2{\cdot}2H_2O$], which is representative of the recrystallization of the starting material dissolved in the phosphating solution.[5] In contrast, the XRD pattern for the 5.0% p(AA) sample has two new spacings at 0.311 and 0.437 nm. These spacings reveal the presence of strengite ($FePO_4{\cdot}2H_2O$).[6] Therefore, the Fe-rich reticular and Zn-rich plate-like crystals which were observed by SEM-EDX analyses, are associated with the formation of $FePO_4{\cdot}2H_2O$ and $Zn_3(PO_4)_2{\cdot}2H_2O$ phases, respectively. Although XRD spacings for conversion coatings modified with lesser amounts of p(AA) are not shown, it is known that insoluble ferric phosphate ($FePO_4$) is present in normal Zn·Ph coating layers on steel surfaces.[7] The precipitation of strengite may occur through the following hypothetical conversion sequences:

$$Fe + 2H_3PO_4 \rightarrow Fe(H_2PO_4)_2 + H_2\uparrow \quad (1)$$

$$4Fe(H_2PO_4)_2 + O_2 \rightarrow 4FePO_4 + 4H_3PO_4 + 2H_2O \quad (2)$$

$$FePO_4 + 2H_2O \rightarrow FePO_4{\cdot}2H_2O \quad (3)$$

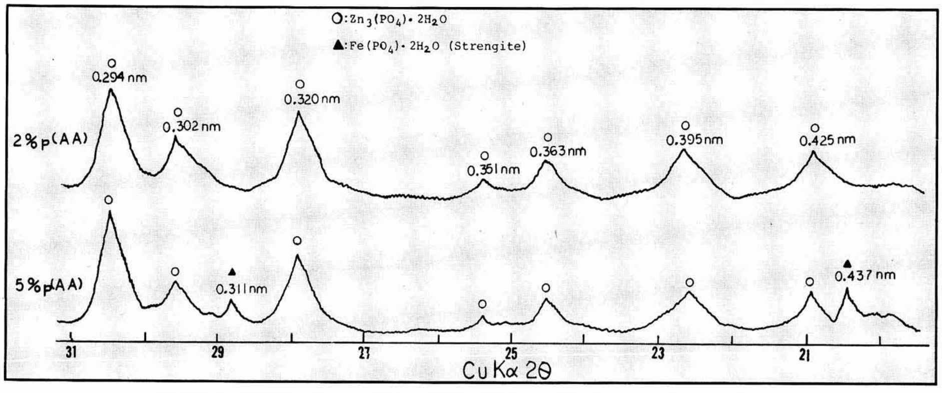


Figure 5—XRD tracings of 2% and 5% p(AA)-modified conversion coatings

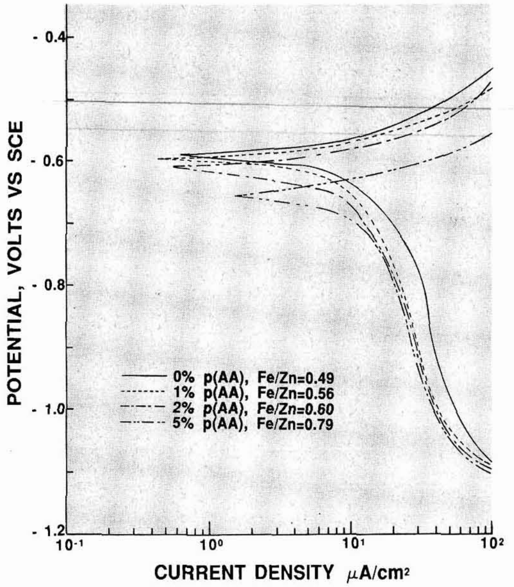


Figure 6—Polarization curves for zinc phosphated steel specimens containing p(AA) concentrations of up to 5% in aerated 0.5M NaC1 solutions

Once a dense layer of this insoluble ferric phosphate has been deposited on the steel, further precipitation may be retarded because of the precipitation of $Zn_3(PO_4)_2{\cdot}2H_2O$ as the major conversion layer. This information indicates a large suppression of Zn·Ph crystal growth which occurs as a result of adding high concentrations of p(AA). This results in the production of thinner conversion coatings containing a high proportion of ferric phosphate compounds. Thus, the coating thickness and iron content appears to depend on the amount of p(AA). Experimentally, the measured thicknesses for coatings containing 0, 1, 2, and 5% p(AA) were approximately 30, 28, 25, and 20 μm, respectively.

Efforts were made to determine how the proportions of Fe existing in the conversion layers participate in the corrosion protection process. To obtain this information, the polarization behavior of p(AA)-modified conversion specimens in an aerated 0.5M NaC1 solution was determined, and the resultant polarization curves were correlated as a function of EDX Fe/Zn ratios for various p(AA) concentrations. These results are given in *Figure* 6. A comparison of the cathodic polarization areas from the unmodified Zn·Ph and p(AA)-modified Zn·Ph specimens indicates two noteworthy features: (1) the short-term steady-state current value for the modified specimens is lower than that for the unmodified one in the potential region between − 1.0 and − 1.1 v, and (2) the incorporation of 5% p(AA) resulted in a shift in corrosion potential to a more negative site and an increase in current density at the potential axis. The lower current density for the modified specimens [result (1) previously mentioned] compared to that of the specimen without p(AA), is attributed to a low hydrogen reduction as well as to a less active surface. This confirms that the oxygen reduction reaction is inhibited by the p(AA) macromolecule chemisorbed on the crystal faces. With regards to the second observation, the introduction of 5% p(AA) into the conversion layer seemed to reduce the corrosion-resistive effectiveness. From this observation and the previously discussed SEM-EDX data, it can be concluded that the presence of agglomerated strengite in the $Zn_3(PO_4)_2{\cdot}2H_2O$ layer results in an increase in intrinsic phosphate porosity, thereby giving poor corrosion protection.

The electrochemical corrosion studies were extended to explore how the conversion products precipitated onto the steel surfaces during the induction periods for well-crystallized Zn·Ph formations inhibit the corrosion of the steels. The protective ability of the conversion layers formed at a certain stage of deposition was estimated on the basis of comparisons between E_{corr} values. Also, the propagation of the conversion coatings was surveyed morphologically. For these tests, the conversion coatings were prepared by immersing the steel in a 2.0% p(AA)-dissolved zinc phosphating solution at 80°C for 1, 3, 5, 10, 15, and 20 min. Their surface morphologies and chemical elements were studied by a combination of SEM-EDX and X-ray photoelectron spectroscopy (XPS) techniques.

Figure 7 illustrates the results from SEM microprobe and EDX elemental analysis of steel surfaces after immersion in the phosphating solution at 80°C for one minute. As expected, the SEM image for the surface treated for such a short period revealed a rough steel texture, and identical crystal formations could not be seen. The EDX spectrum for this surface indicated that Fe was the pre-

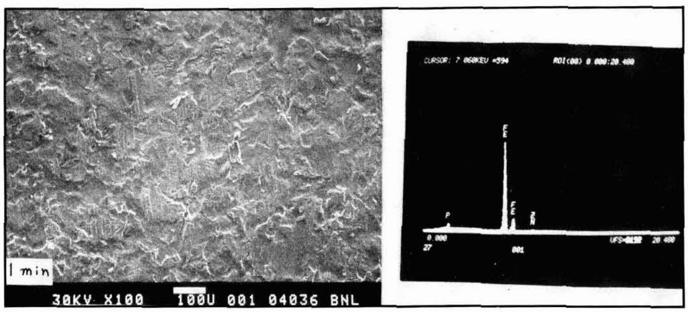


Figure 7—SEM micrograph and EDX of steel surface after immersion in phosphating solution at 80°C for 1 min

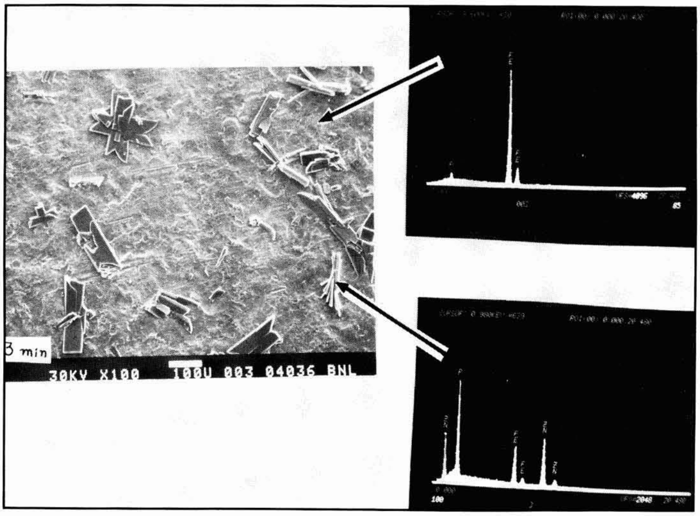


Figure 8—SEM micrograph and EDX of conversion crystals precipitated irregularly on iron phosphate layer after treatment for 3 min

dominant element present. Other elements present, but with lower peak intensities, were P and Zn. The micrograph in *Figure* 8 shows that the scattering precipitation of rectangular-like embryo crystals on the steel surface seemed to commence after one to three minutes of treatment. The EDX spectrum for this crystal, also shown in *Figure* 8, indicates that the dominant element was P, instead of Fe. In addition, the peak intensity for Fe was almost equal to that of Zn. Therefore, the embryo crystals may have been composed of a formation of Fe-incorporated zinc phosphate compounds.

Extending the treatment to 5 min resulted in further covering of the substrate surface with the embryo crystals, and after 10 min, the available substrate surfaces were completely covered (*Figure* 9). As indicated by the accompanying analysis, these crystals contained significant amounts of Zn. Although the concentration was somewhat less than that of P, it was greater than that of Fe. It is believed, therefore, that the well-formed zinc-rich phosphate crystal was primarily a zinc phosphate hydrate compound.

To support these findings, the changes in elemental composition of p(AA)-modified coating surfaces that occurred as a function of conversion time, were quantified using XPS. These results are summarized in *Table* 1. As noted, for a conversion period of 1 min, the principal element occupying the outermost surface sites was oxygen, and the secondary predominant elements were carbon and iron. The percentages of detected phosphorus and zinc atoms were only 2.4 and 1.8%, respectively. With respect to the carbon species, the spectrum for the C_{1s} region indicated the presence of a hydrocarbon-type carbon peak at 285.0 eV, and a carboxylic acid carbon peak at approximately 288.9 eV. Since carbon contaminants of approximately 4.0% were previously reported for conversion layers produced without the use of p(AA),[8] the source of the C is not solely the p(AA) macromolecules, but also carbon contamination dissociated from the steel during the conversion reaction processes and absorbed from the atmosphere. The XPS signal intensities for Zn and P atoms which indicate the precipitation of Zn·Ph crystals, increase rapidly over the first 10 min. This rate then gradually increases until near maximum concentrations are reached after approximately 20 min. In contrast, the amount of Fe greatly diminished with elapsed conversion time, from 13.8% for 1 min to 5.4% for 20 min. This information supports that obtained from the SEM-EDX analyses, namely, conversion times of approximately 10 min are required to precipitate highly dense zinc-rich phosphate compounds. On the other hand, no significant reduction in the C atom content was observed. This suggests that chemisorption of p(AA) on the embryonic crystal faces occurs throughout the entire conversion process, even though a small amount of C contamination may be present on the surface.

Table 1 also gives the E_{corr} values for various precipitation times. As is evident from the results, the E_{corr} values rapidly change to less negative values at treatment times up to 10 min, and then gradually change with further time. It appears that the well-precipitated zinc-rich phosphate layers formed during conversion periods of ≥10 min are responsible for the corrosion-inhibiting ability of the coatings, whereas the iron-rich conversion layers which are produced at the beginning of the phosphating treatment provide less protection.

Another important goal of our work was to obtain knowledge regarding possible interactions between p(AA) and the crystal conversion coating, and then to

Table 1—XPS Elemental Compositions and Corrosion Potential Values as a Function of Conversion Time for Steel Treated with 2.0% p(AA)-Modified Zn·Ph

Conversion Time (min)	Atomic Percentage,					E_{corr}, Volt
	P	C	O	Fe	Zn	
1.........	2.4	18.7	63.3	13.8	1.8	−0.810
3.........	—	—	—	—	—	−0.725
5.........	3.2	18.9	59.3	10.9	7.7	−0.730
10.........	4.9	19.1	58.7	6.8	10.5	−0.640
15.........	—	—	—	—	—	−0.610
20.........	6.3	19.4	57.7	5.4	11.2	−0.600

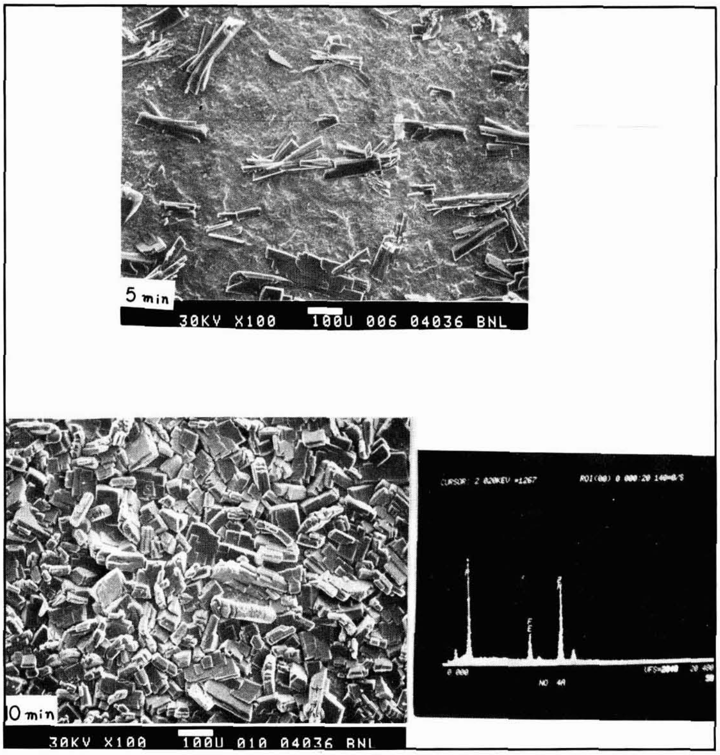
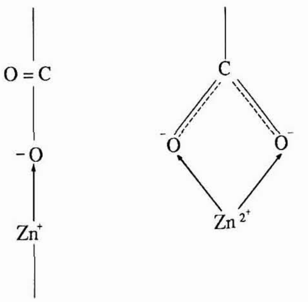


Figure 9—SEM micrographs and EDX for 5- and 10-min-treated surfaces

understand how the interfacial reaction products act to increase the corrosion resistance of Zn·Ph-coated steel. The former was investigated by means of XPS, and it was observed that even when a high concentration of 5% p(AA) was used, the p(AA) film deposited at the outermost surface sites was thin enough to see the photoemission signal from the underlying Zn- and Fe-phosphate compounds. The binding energy (BE) scale in the XPS spectra was calibrated with the C_{1s} of the principal hydrocarbon, "CH_n," peak fixed at 285.0 eV as an internal reference standard.

The C_{1s} core level photoemission spectra for bulk p(AA), and 1% p(AA)- and 5% p(AA)-modified conversion coating surfaces are shown in *Figure* 10. The C_{1s} region of the bulk p(AA) (*Figure* 10a) has two main peaks; 285.0 eV corresponds to the hydrocarbons in the main chain and 288.9 eV ascribes to the carbon originating from the carboxylic acid, COOH, in the p(AA). The spectrum for the 5% p(AA)-modified coating (*Figure* 10b) shows a shift in the peak to a lower BE site and the appearance of a new peak at 287.2 eV, as compared to that of the bulk p(AA). The new peak emerging at about 1.7 eV lower BE from the COOH peak, is located between a carbonyl carbon, C=O, at approximately 288.0 eV and a carbon-oxygen single bond at approximately 286.5 eV.[9] For samples containing 1% p(AA) (*Figure* 10c), a further shift in the COOH peak toward lower BE was observed.

Figure 11 shows typical 2p doublet separation spectra for the Zn2p3/2 and 2p1/2 lines from unmodified and modified conversion coatings. The distance separating the 2p3/2 and the 2p1/2 energies for both the unmodified and modified coatings is in the range of 23.7-23.5 eV. This means that the presence of p(AA) in the conversion coatings does not change the separation distance. Therefore, these peaks appear to be assigned to zinc originating from the zinc phosphate dihydrate crystal. The main difference between these spectra is the shift of the 2p3/2 and 2p1/2 peaks to higher energy sites when the p(AA) content is reduced. For 5% and 1% p(AA) concentrations, the values of 1022.5 eV (*Figure* 11e) and 1022.9 eV (*Figure* 11f) for the 2p3/2 core level correspond to increases of 0.1 and 0.5 eV, respectively, compared to unmodified coatings. The reason for the increased Zn2p peak energy, the decrease in BE of the COOH carbon, and the new peak at 287.2 eV for the C_{1s} region, may be charge transfer from the Zn in the crystal coating to the electron accepting oxygen portion in the functional pendent group of p(AA). In fact, the O_{1s} core level (not shown) at the p(AA)/Zn·Ph interfaces indicated the presence of a strong peak at 531.4 eV which ascribes to the formation of COO-metal complexes. Two possible Zn-O bond formations for carboxylate-linked Zn complexes yielded through a mechanism involving charge transfer reactions at p(AA)-Zn·Ph interfaces are discussed in the following.



(I) (II)

One of the complex formations is a zinc-oxygen-carbon (Zn-O-C) bond structure (I) which is produced by the reaction of an oxygen atom in the carboxylic anion with a Zn atom. The other (II) may be formed by a charge transferring interaction between both oxygens in the carboxylate group and the Zn atom. The latter formation relates to the assignment of the new line at 287.2 eV which is situated between the C=O and the C—O bond peaks. The separation spectra of Fe2p for these samples is illustrated in *igure* 12. For the p(AA)- covered samples, the 2p1/2 peak at 725.0 eV appears at almost the same position as the uncovered. However, the 2p3/2 core level line shifts to lower BE with increased p(AA) concentrations, thereby resulting in an increase in the separation distance between the 2p1/2 and the 2p3/2 peaks. This seems to imply that the increased p(AA) concentration introduces different Fe compounds into the top surface of the conversion coatings. Thus, it is impossible to consider an interaction between p(AA) and a specific Fe compound because the Fe composition incorporated into the Zn·Ph top layers depends upon the p(AA) concentration. Nevertheless, it was found that the interfacial reaction products at the p(AA)-Zn·Ph interfaces are Zn-O-C complexes containing an electrostatic bond yielded through the charge transferring reaction.

The studies were extended further to investigate the influence of these interfacial complex products upon the alkali-dissolution of the conversion coatings. *Table* 2 indicates the changes in the EDX intensity ratios of P/Zn and Fe/Zn, and E_{corr}, as a function of p(AA) for phosphated steel specimens after exposure to a 0.1M NaOH solution for 1 hr at 25°C. As shown in *Table* 2, the P/Zn ratios for all exposed specimens are significantly lower than those for the unexposed specimens. All of the Fe/Zn ratios increased. The former suggests the dissociation of a greater amount of phosphate brought about by the alkaline dissolution of Zn·Ph. Thus, this seems to imply that interfacial reaction products composed of Zn-O-C complexes do not significantly inhibit the alkali-dissolution of conversion coatings. However, the differences in Fe/Zn ratios compared with those from the unexposed samples decreased significantly with increased p(AA) concentrations, thereby suggesting that p(AA) macromolecules diffused electrostatically onto Zn·Ph crystal faces act to decrease the rate of ferrous ion dissociation from the steel.

Table 2—Variations in P/Zn and Fe/Zn Intensity Count Ratios and Corrosion Potential Values, E_{corr}, as a Function of p(AA) Concentration for Phosphated Steel Specimens After Exposure to 0.1M NaOH Solution

PAA, Before Exposure				After Exposure		
%	P/Zn	Fe/Zn	E_{corr}, Volt	P/Zn (Difference[a])	Fe/Zn (Difference)	E_{corr}, Volt
0...	0.55	0.49	−0.592	0.26 (−52.7%)	0.72 (+46.9%)	−0.620
1...	0.54	0.56	−0.595	0.24 (−55.6%)	0.75 (+33.9%)	−0.540
2...	0.57	0.60	−0.610	0.23 (−59.7%)	0.79 (+31.7%)	−0.521
5...	0.55	0.74	−0.651	0.25 (−54.6%)	0.89 (+20.3%)	−0.480

(a) Difference compared with that of unexposed specimen; difference, % = [(ratio of exposed specimen − ratio of unexposed specimen)/ratio of unexposed one] × 100.

The E_{corr} values for specimens after exposure to NaOH were determined from the polarization curves in aerated 0.5M NaCl solutions. To investigate the variation in Na atom percentages as a function of p(AA), the

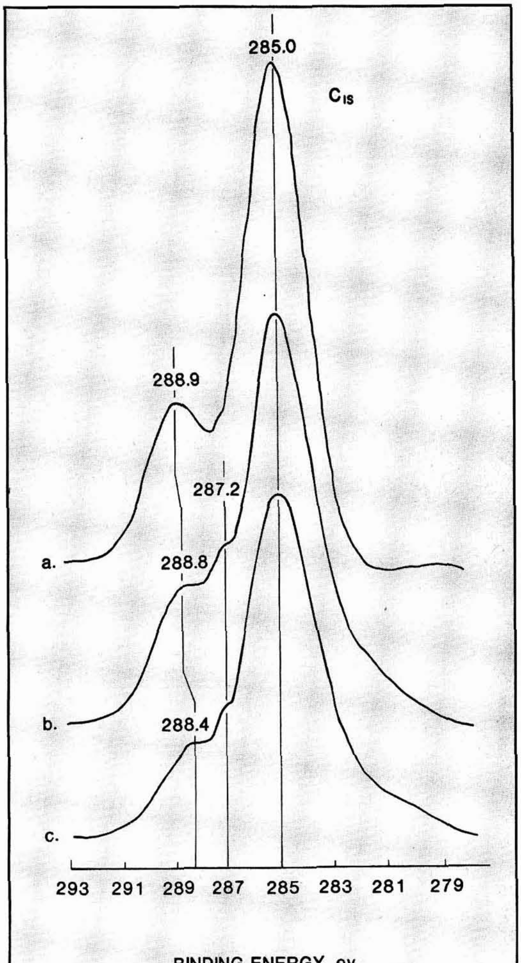


Figure 10—(a) C_{1s} spectra for bulk p(AA); (b) 5% p(AA)-Zn·Ph interface; and (c) 1% p(AA)-Zn·Ph interface

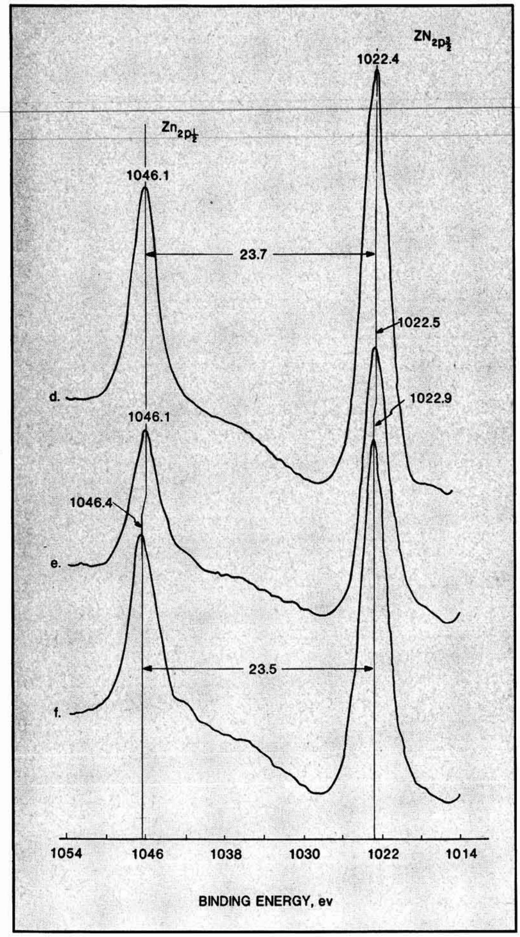


Figure 11—(d) Zn2p separation spectra for unmodified Zn·Ph; (e) 5% p(AA)-modified; and (f) 1% p(AA)-modified Zn·Ph

surfaces of the exposed specimens were also examined using XPS. As noted in *Table* 2, the E_{corr} values for all the exposed specimens containing p(AA) shifted to less negative positions, as compared to those for the unexposed ones. The largest shift was observed for specimens modified with 5% p(AA). In the XPS quantitative evaluations (see *Figure* 13), of particular interest is the variation in C, Na, Zn, and Fe concentrations as a function of the amount of p(AA). The signal intensity for Na tends to increase monotomously as the C which is related directly to that of p(AA), increases. The amount of Fe and Zn decreases. *Figure* 14 gives comparisons between the C_{1s} spectrum features of 1% p(AA)-modified Zn·Ph before (*Figure* 14j) and after (*Figure* 14k) exposure to NaOH solutions. The most striking features in the spectrum of the exposed samples were the shift in the carboxyl carbon, —C(=O)—O—, peak to a higher BE site, and a decrease in intensity of the peak at 287.2 eV, while maintaining the same position of hydrocarbons at 285.0 eV. In conjunction with the increase of 0.3 eV in the BE of carboxyl carbon, there was a corresponding decrease in the BE in the Zn2p3/2 region for the sample subjected to NaOH exposure (*Figure* 15m), as compared with that of the unexposed sample (*Figure* 15l). The excitation of the new line at 1020.4 eV for the exposed samples is assigned to the formation of new Zn-based compounds brought about by the alkali-dissolution of the conversion coating. This seems to suggest that during the exposure to the NaOH solution, Na ions act to promote the breakage of the Zn-OOC electrostatic bonds. The breakage may be related to an elemental substitution of Zn for Na. However, the corresponding Na_{1s} core level spectra have not yet been clearly resolved because of a very noisy exciting peak feature.

To obtain information regarding the transformation of Zn-OOC into a Na-OOC bond structure, infrared (IR) spectroscopic analyses were performed. However, direct observations that could be used for the clarification of the interaction structure at the interface were very difficult to make using IR. Thus, to create a resemblant reaction model that would yield a product that was detectable using IR, a mixture of 50 wt% p(AA) and 50 wt% $Zn_3(PO_4)_2 \cdot 2H_2O$ was prepared for use in the IR study. The mixture was allowed to evaporate in a vacuum oven at 150°C, and the residue was then exposed in 0.1M NaOH for one hour. After the exposure, the powdered samples were incorporated into KBr pellets for IR analysis. For comparison purposes, IR spectra for the unex-

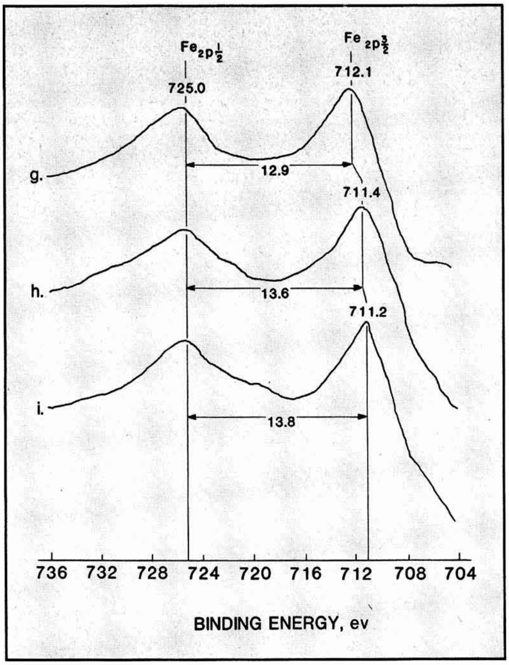


Figure 12—(g) XPS spectra of Fe2p½ and 2p⅔ regions for unmodified Zn·Ph; (h) 1% p(AA)-; and (i) 5% p(AA)-modified Zn·Ph

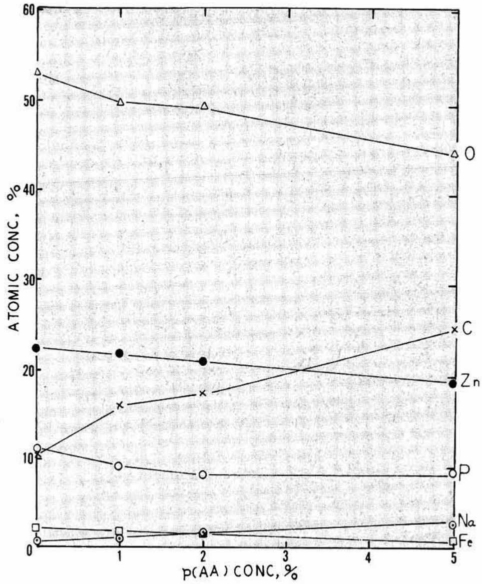


Figure 13—Atomic percentage vs p(AA) concentration for unmodified and p(AA)-modified Zn·Ph surfaces after exposure to 0.1M NaOH for 1 hr

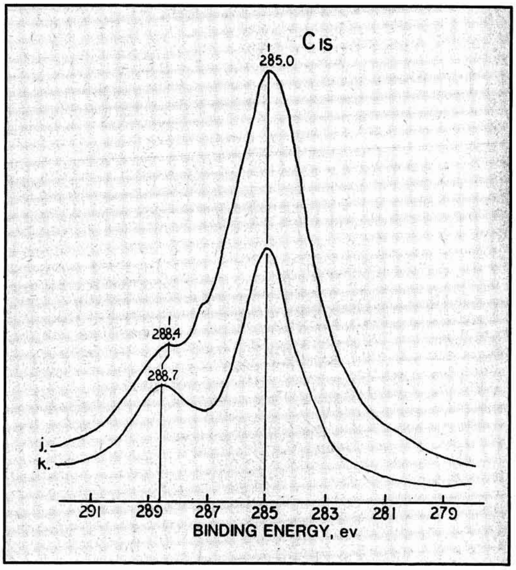


Figure 14—C_{1s} spectra for 1% p(AA)-modified Zn·Ph before (j) and after (k) exposure in 0.1M NaOH solution

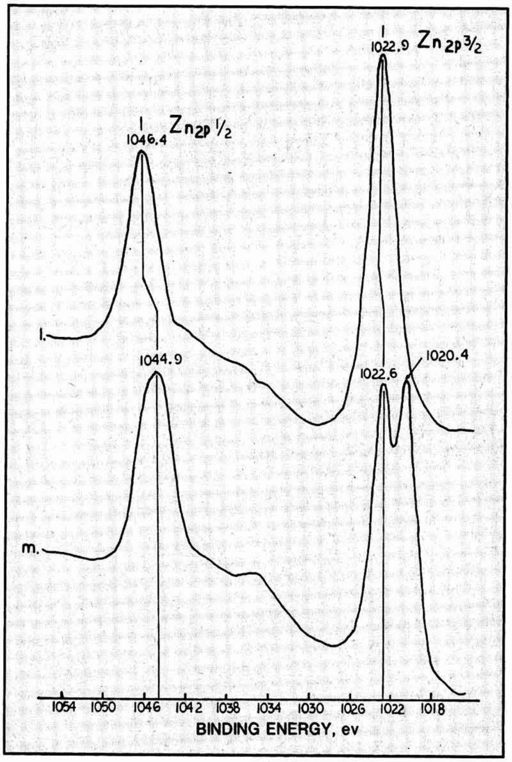


Figure 15—(l) Zn2p regions for unexposed; and (m) NaOH-exposed p(AA)-Zn·Ph

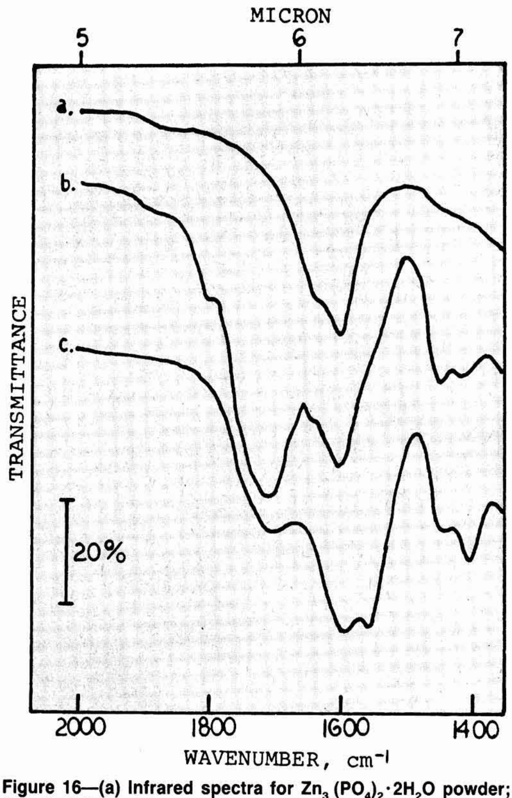


Figure 16—(a) Infrared spectra for $Zn_3(PO_4)_2 \cdot 2H_2O$ powder; (b) p(AA)-$Zn_3(PO_4)_2 \cdot 2H_2O$ composite; and (c) composite subjected to NaOH exposure

Table 3—Comparison Between the Delaminated Areas of Polyurethane-Coated Steel, Unmodified Zn·Ph, and p(AA)-Modified Zn·Ph Panels Exposed to 0.5M NaCl Solution

p(AA), %	Delaminated Area, mm²		
	1 Day	3 Day	6 Day
PU/Steel Joint	113	1256	—
0	0.8	4.9	19.6
1	0.2	2.5	10.8
2	0.2	0.9	7.1
5	0.2	0.9	4.9

posed mixture and the $Zn_3(PO_4)_2{\cdot}2H_2O$ powder were also determined. These spectra for frequency ranges from 2000 to 1350 cm^{-1}, are given in *Figure* 16. As seen in *Figure* 16a, the spectrum of the $Zn_3(PO_4)_2{\cdot}2H_2O$ powder indicates the presence of a strong band near 1610 cm^{-1} which can be assigned to the crystallized water in Zn·Ph. The spectrum for the p(AA)-$Zn_3(PO_4)_2{\cdot}2H_2O$ composite sample (*Figure* 16b) indicated the C=O in carboxylic acid at 1710 cm^{-1} and the main chain CH_2 of saturated methylene at 1440 cm^{-1}, in addition to crystallized water at 1610 cm^{-1}. The NaOH-exposed composite produced a dramatic change in the spectrum. Two new sharp bands appeared at 1550 and 1410 cm^{-1} (*Figure* 16c). The formation of bands at these frequencies and the decrease in the C=O peak intensity at 1710 cm^{-1} indicate the formation of Na^+ $^-$OOC-salt complexes.[10]

On the basis of this information, the following statements can be made regarding the function of p(AA) in reducing the dissociation of Fe and improving the protection of the conversion coatings when subjected to NaOH. When the p(AA)-modified conversion coatings come in contact with an NaOH solution, the reactive Na^+ ion will break the Zn-OOC electrostatic bonds in the interfacial reaction products to form a —COO^- Na^+ salt complex which contains an ionic bond. This transformation from a Zn-O electrostatic bond to an Na-O ionic bond can be expressed as follows:

$$\text{—COO—Zn— } + 2NaOH \rightarrow \text{—COO}^- \ Na^+ + \text{NaO—Zn— } + H_2O$$

It can therefore be assumed that the precipitation of a salt complexed macromolecule formed by an ionic reaction between the carboxylic anion and the Na^+ cation during the progression of the alkaline dissolution of the conversion layers can serve as a barrier to the ferrous ion dissociation from the steel. This reflects on the corrosion resistance of the steel.

The effect of p(AA) macromolecules existing at the outermost surface sites of the modified Zn·Ph coatings on the resistance to the cathodic delamination of the polymeric topcoat from the Zn·Ph, was also investigated. In these studies, a polyester-modified polyurethane topcoat was applied to modified Zn·Ph specimens. The cathodic delamination tests for the PU-coated Zn·Ph specimens were conducted in an air covered 0.5M NaCl solution

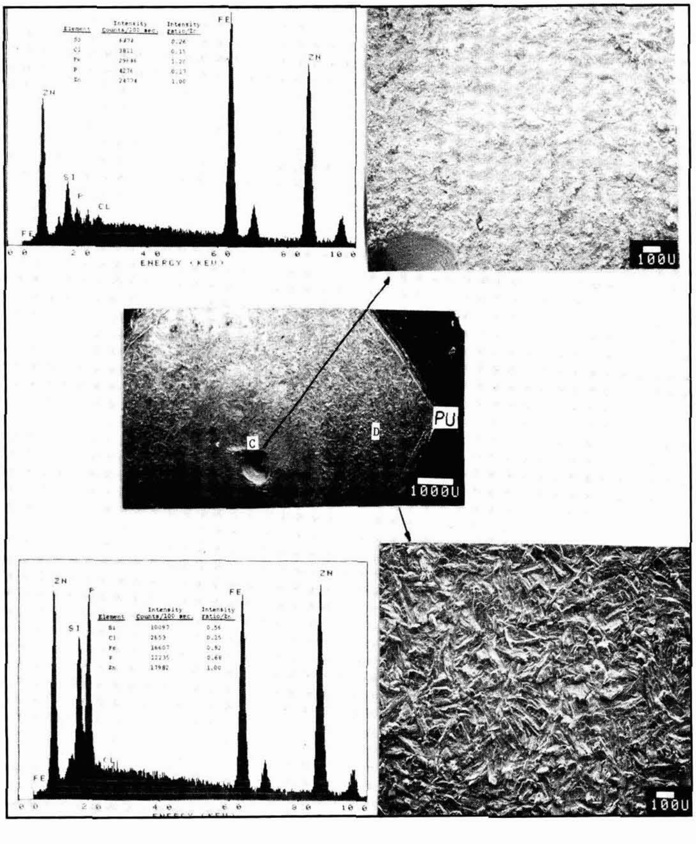


Figure 17—SEM micrographs and EDX analyses near a defect (C) and at the delaminated front (D) of a conversion coating site after removal of the PU film from the PU/unmodified Zn·Ph joint system

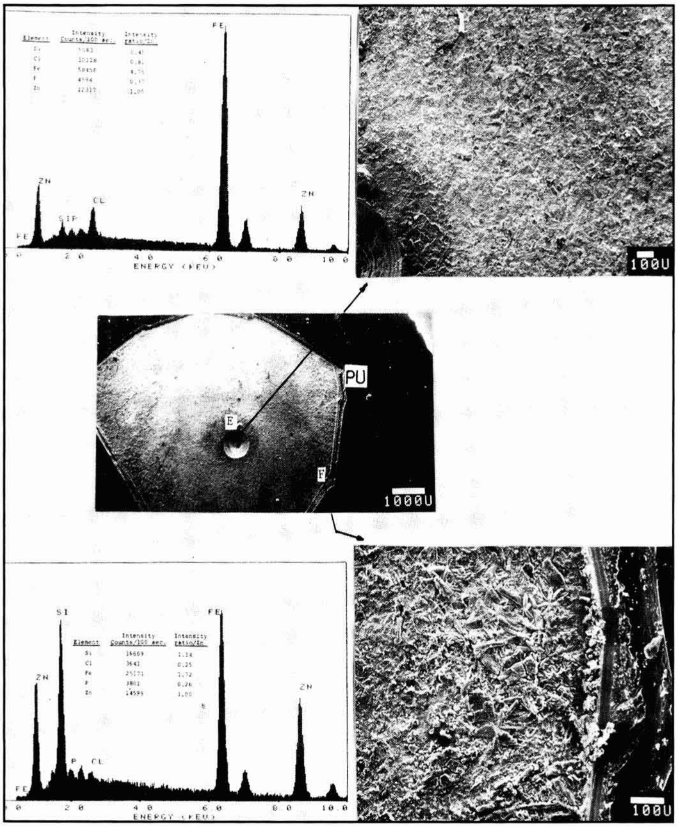


Figure 18—SEM microprobe and EDX analysis near a defect (E) and at the delaminated front (F) of a p(AA)-modified conversion coating after removal of the PU from the PU/5% p(AA)-modified Zn·Ph joint system

using an applied potential of − 1.5 volts vs SCE for up to six days. A defect was made using a drill bit with a diameter of approximately 1 mm. After exposure, the specimens were removed from the cell and allowed to dry. The PU coating was removed by cutting, and a delaminated region which appeared as a light gray area adjacent to the defect, was detected. Since the 0.5M NaCl electrolyte releases a high concentration of sodium ions, the ionic reaction between the OH^- ions generated by the oxygen reduction reaction and the Na^+ ions that migrate through the PU topcoat, can lead to a high NaOH concentration beneath the PU layers.[11] These test results are reported in *Table* 3. The PU-to-blank steel joint systems exhibited considerable delamination of the PU after exposure for only one day. In contrast, the presence of a conversion coating as an intermediate layer in the PU/steel joint system significantly reduced the rate of cathodic delamination. Further improvement was obtained using the p(AA)-modified conversion coating systems. As seen in the table, the delamination rates for the six day-exposed specimens decrease with increased p(AA) concentrations ranging from 1 to 5%.

To elucidate the reasons for the results, the failed interfaces delaminated by the cathodic reaction after exposure for six days, were examined using SEM-EDX combined techniques. Both the backside of the PU topcoat and the conversion coating side of the cathodically delaminated PU/unmodified and/5% p(AA)-modified Zn·Ph interfaces were subjected to an inspection of the failure locus. The quantitative data provided by EDX spectra contain the intensity counts per 100 sec of the selected elements and the elemental ratio of an individual element-to-zinc peak counts. The energy regions of the primary line of Si, P, Cl, Fe, and Zn that were used to determine the intensity counts were 1700-1850, 1950-2100, 2544-2706, 6306-6519, and 8525-8750 eV, respectively. It should be noted that the line near 900 eV is the primary line of Na overlapped in a secondary Zn line.

Figure 17 shows SEM micrographs and EDX analysis of the substrate surface site after delamination of the PU film from a PU/unmodified Zn·Ph joint system. As seen in the middle photograph on the figure, the SEM topographical image reveals the existence of two discernible areas. Site C represents an area approximately 1300 μm in diameter surrounding a defect and the other, site D, is at the edge of delaminated PU. The top photograph which is an enlargement of site C, discloses that almost all of the crystalline conversion coating surrounding the defect was dissolved by the cathodic reaction occurring in this area beneath the PU film. EDX data from this region indicate the presence of large amounts of Fe and Zn, and small amounts of Si, P, and Cl. The Si originates from the silica flour used as a filler in the PU topcoat, and therefore, it infers that a small amount of PU remained on the dissolved coating surface. When compared with the P/Zn ratio for the coating before exposure (*Figure* 3), the conspicuously lower ratio of 0.17 indicates that a majority of the P atoms was removed from the conversion coating adjacent to the defect. The P seems to have been replaced by Fe which came from the substrate. Hence, the corrosion product formed by the dissolution of the crystal coating was composed of Fe-rich zinc compounds.

The lower portion of *Figure* 17 shows SEM-EDX results from the site D area. It is apparent from the SEM microstructure features and the high P/Zn and Fe/Zn ratios, that the crystal coating in the region remained on the substrate surface, and that the remaining crystals had a normal zinc phosphate layer containing a large amount of Fe.

A similar analysis was performed for a substrate beneath a film which had delaminated from a PU/5% p(AA)-modified phosphate joint system.These results are given in *Figure* 18. Again, the delaminated surface appears to have two distinct regions. The first, site E, is an area adjacent to a defect, and the second, site F, is at a delaminating front. The EDX data for site E show mostly Fe associated with very small amounts of P and Zn. This indicates that most of the p(AA)-modified coating was removed from the substrate during the process of delamination.

Comparison with the count intensity for the Si line from a region near the defect on the unmodified phosphate surface [*Figure* 17 (top)], reveals a weaker line, thereby indicating that the amount of residual PU present is less than that on the unmodified substrate surface. The second area (bottom SEM-EDX data) was characterized by the presence of a crystalline coating comprised of Fe-rich Zn compounds containing a small amount of P. The total area of these remaining crystals at the delaminating front was found to be much smaller then that observed for the delaminated unmodified one. This relates to the higher bonding forces generated at the interface between the PU and the p(AA)-modified coating.

The backsides of PU films delaminated from unmodified and p(AA)-modified conversion coating surfaces are shown in the SEM images of *Figure* 19 along with EDX results recorded near a defect. For the former (see top figure), EDX indicates that the predominant element is Si. Other elements present, but with low peak intensities, are P, Fe, and Zn. In contrast, the chemical composition of the PU removed from the p(AA)-modified substrate was different. Referring to the SEM-EDX data at the bottom of *Figure* 19, one of the differences was the presence of Na indicated by the most intensive Na-Zn mix line near 900 eV. The existence of a high Na level is due to migration of Na ions to the p(AA) diffused in the crystal layer in order to form the neutral Na-complex p(AA). In addition, the Si/Zn and Fe/Zn ratios were lower and higher, respectively, than those for the interfacial topcoat in the PU-unmodified phosphate joint systems. This information, in conjunction with the SEM images which revealed a rough surface texture for the delaminated PU films, suggests that the amount of the modified crystal coatings which is transferred to the PU sites is relatively larger than that at the PU-unmodified coating interfaces.

The results from the cathodic delamination mechanism studies of the PU/unmodified phosphate joint system are in agreement with those obtained by Leidheiser.[4] Namely, the hydrogen evolution which takes place and the defect lead to blistering of the PU film during the first stage of a delamination process, and then an oxygen reduction reaction at some point away from the defect occurs as the dominant cathodic reaction. The NaOH solution produced by the reaction between the OH^- generated by the oxygen reduction and the migrated Na^+ then acts to dissolve the conversion coatings at the PU/

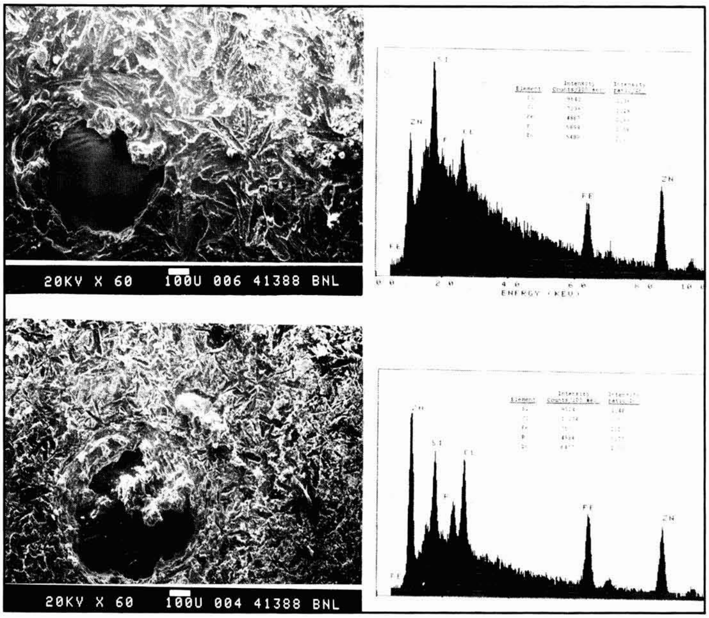


Figure 19—SEM-EDX of adhesive side of PU film delaminated from unmodified (top) and 5% p(AA)-modified Zn·Ph substrates (bottom) near defects

conversion coating interfaces. There is no doubt that the high pH environment generated at the leading edge of the delaminated regions results in the dissolution of the conversion coatings which promotes significantly the extent of the cathodic delamination area of PU topcoat from the conversion coating. However, our recent paper[12] described that the PU film adjacent to the metal surface in the presence of NaOH is susceptible to hydrolysis. Therefore, the high extent of the delamination areas, which is represented by the remaining portions of the conversion crystals on the substrate after delamination of the PU films, seems to verify that the cathodic failures are not only due to the alkaline dissolution of conversion coatings, but also hydrolysis of the interfacial PU film.

On the other hand, in the PU/p(AA)-modified coating joint systems, the major reason for reducing the rate of delamination is the intermolecular chemical reactions between the carboxylic acid groups of p(AA) existing at the outermost surface sites of the conversion coating and the isocyanate groups of PU. The interfacial reaction product formed through the interaction mechanism given in the following, could result in a lower susceptibility to hydrolysis of the particular isocyanate which is essentially hyrolyzed to substitute the primary amine in the presence of NaOH.[8,13,14]

$$\text{—R—NCO + HOOC—R—} \rightarrow \text{—R—NH—CO—O—CO—R—} \rightarrow$$
$$\text{—R—NH—CO—R— + } CO_2$$

The previously mentioned statements suggest that the initial failure in this joint system occurs at the conversion coating/steel interface, in contrast with the PU/conversion coating interfacial regions for the PU-unmodified coating joint systems.

CONCLUSIONS

The following generalizations can be drawn from our results.

The precipitation of dense crystalline conversion coating on cold-rolled steel by a dissolution-recrystallization process using zinc orthophosphate dihydrate as a starting material, considerably reduced the corrosion rate of steel in an aerated NaCl solution.

When modified with p(AA) electrolyte macromolecules, the conversion coatings yield low hydrogen evolution as well as a less active surface.

The precipitation of a large amount of strengite, $FePO_4 \cdot 2H_2O$, formed by adding an excessive amount of p(AA), seems to result in a less effective protective coating.

The interfacial reaction products at the p(AA)-zinc phosphate interfaces, were identified to be Zn-OOC complexes yielded by a charge transfer reaction between Zn atoms in the crystalline conversion coating and the electron accepting oxygen portions of the p(AA).

The resultant Zn-O electrostatic interfacial bond had no significant effect on the rate of alkaline dissolution of conversion coatings subjected to NaOH exposure, because of the breakage of the Zn-O bond by the attack of reactive Na^+.

The formation of $—COO^- \, Na^+$ salt complexed macromolecules precipitated by transformation of Zn-O electrostatic bonds into Na-O ionic bonds are subservient to the corrosion resistance of steel.

The intermolecular chemical reaction between the carboxylic groups of the p(AA) existing at the outermost surface sites of the conversion coating and the isocyanate groups in polyurethane topcoats led to a lower rate of cathodic delamination of the polyurethane film from the substrate. Thus, the beginning of the delamination failure occurs through the conversion coating/steel interface, as compared to that at the polyurethane/conversion coating interface in the polyurethane-unmodified coating joint system.

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1315 Walnut Street, Suite 832, Philadelphia, PA 19107

Society Meetings

BALTIMORE .... JAN.

"Hydrocarbon Resins"

Herman H. Shuger Memorial Award winner Harry Schwartz, of Lenmar, Inc., was presented a collage of photographs from the Awards Dinner. The Shuger Award is presented by the Baltimore Coatings Industry Awards Council.

The meeting's speaker was Paul Badie, of Norsolor-Orkem Group, who talked on "HYDROCARBON RESINS IN PAINTS AND VARNISHES."

Dr. Badie described the process of making aromatic and aliphatic hydrocarbon resins. He discussed the structures of aromatic resins and some of the properties of full aromatic hydrocarbon resins, including: low coloration, good compatibility, stability, and nonreactivity. In conclusion, the speaker compared the physical properties and compatibility of hydrocarbon resins with alkyds, solvents, and binders.

Q. What is the ratio of aromatic to aliphatic hydrocarbon resins when manufactured?

A. This is determined by what you want to produce. A 0-100% range is possible.

Q. Would hydrocarbon resins help penetration in wood?

A. Adding hydrocarbon resins to preservatives will give added protection to the wood.

GARY MORGERETH, *Secretary*

BIRMINGHAM............. DEC.

"Statistical Process Control"

R.L. Staples, of MBP Industrial Finishes Ltd., was presented with a 25-Year Pin, for his years of service to the Club.

Alan D. Leslie, of Ford Motor Co., was the speaker for the evening. He spoke on "THE USE OF STATISTICAL PROCESS CONTROL IN ACHIEVING NEVER-ENDING IMPROVEMENT IN QUALITY."

The speaker stated that a commitment from all levels of management is required if Statistical Process Control is to be used in quality improvement. Mr. Leslie went on to discuss: quality as it relates to customer requirements, defects, prevention of waste, and the different requisites for dimensioned products and dimensionless materials.

In conclusion, Mr. Leslie noted that an individual manufacturer must decide how Statistical Process Control techniques should be applied. Also, the manufacturer must not forget the objective of finding how the process can be improved.

G.W. JENKINS
Acting Secretary

BIRMINGHAM............. JAN.

"Metal Can Interior Coatings"

Society member Raymond H. Good, of Holden Surface Coatings Ltd., gave the meeting's presentation. Dr. Good discussed "RECENT ADVANCES IN METAL CAN INTERIOR COATINGS."

The speaker began his talk with a brief history of can coatings. Dr. Good stated that original can coatings were just tin plate on iron. However, the high cost of tin coatings led to the development of other interior can coatings. Up until 1950, phenolics and oleo resinous coatings were used. Vinyl copolymers also were used, but for foods that did not require processing. The current economic requirements for tin usage in interior can coatings have been studied carefully. The goal is for less tin or possibly no tin in interior can coatings.

Dr. Good noted that environmentally, the elimination of lead in the can seam and the lessening of solvent emission in the coating process have been achieved. Also, the speaker said new engineering techniques, such as draw-redraw and wall ironing, have increased line speeds and efficiency.

Dr. Good described the advantages and disadvantages of various coating compositions now in use. The newer engineering techniques were discussed further, particularly triple-drawn cans.

In conclusion, Dr. Good confidently said that he expects canned food and drink to be in use for the next few hundred years.

Q. How flexible are electrodeposition coatings?

A. As the cans are preformed, flexibility is not a problem. But, the coatings are tough enough to withstand transit abuse.

Q. How about substitutes for metal, e.g., plastics or glass?

A. There will always be a market for those products. But, metal is ousting glass for beers, etc.

G.W. JENKINS
Acting Secretary

CDIC .... JAN.

"Can Manufacturing"

Steve Bleich, of Davies Can Co., was the meeting's technical speaker. Mr. Bleich gave a talk on "THE HISTORY OF CAN PRODUCTION AND HOW CANS ARE MANUFACTURED."

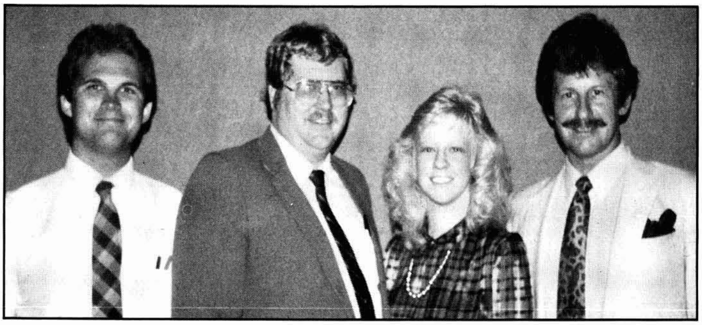
The educational presentation focused on the various small animals housed at the Cincinnati Zoo.

W.E. WHITLOCK, *Secretary*

CHICAGO................. JAN.

"Water-Borne Coatings"

The predinner speaker was Donald Blake, of Dow Chemical U.S.A., who



DALLAS SOCIETY—1988-89 officers are (l-r): Treasurer—Marcus Tennant; President—Bruce Alvin; Secretary—Ronda Miles; and Vice-President—Steve Stephens

WINDY CITY GATHERING—Attending the January meeting of the Chicago Society are: Frank C. Peters, Ross C. Johnson, Vice-President Kevin P. Murray, and President Evans Angelos

spoke on "THICKENERS FOR WATER-BORNE COATINGS."

The speaker focused on the advantages and disadvantages of both cellulosic and noncellulosic thickeners. Starting formulations were given and the advantages and disadvantages of associative thickeners were discussed in detail.

In conclusion, Mr. Blake stated that, while many problems exist, the improved film build, flow, and leveling, as well as spatter resistance, have generated a great deal of interest in the coatings industry.

Edward W. Orr, of BYK-Chemie USA, spoke after dinner on "UNIQUE WETTING AND DISPERSING ADDITIVES—CHEMISTRY AND APPLICATIONS."

Mr. Orr gave a step by step analysis of performance improvement methods for the incorporation of pigments into binder solutions. The function and mode of action of interfacially active substances were described. A detailed explanation of the three parallel stages of dispersion was given. In addition, new interfacially active materials were discussed in regard to effect, classification, and performance enhancement.

KARL E. SCHMIDT, *Secretary*

HOUSTON .... DEC.

"Coatings in Pakistan"

Phil Sonleitner, of Southwest Solvents, was presented a 25-Year Pin for his years of dedicated service to the Society.

Federation and Society Honorary Member Loren B. Odell, FAIC, talked about the quality of life for people involved in the paint and coatings industry in Pakistan. An array of slides highlighted Mr. Odell's presentation.

MICHAEL G. FALCONE, *Secretary*

KANSAS CITY............. JAN.

"Inerting in Coatings Plants"

A moment of silence was observed in memory of Society Honorary Member Barney Pallia who died recently.

The meeting's speaker was Gary Halpern, of Neutronics, Inc. Mr. Halpern's topic was "INERTING IN COATINGS PLANTS: ECONOMICS AND SAFETY."

The speaker's talk focused on the different aspects and methods of preventing plant explosions, such as properly grounding and bonding manufacturing equipment, explosion suppression, and using inert atmospheres with an emphasis on continuous oxygen level monitoring.

MARK D. ALGAIER, *Secretary*

LOS ANGELES............ JAN.

"Styrene/Butadiene Latexes"

Environmental Committee Chairman Dave Muggee, of E.T. Horn Co., talked about the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act.

Violet Stevens, of Dow Chemical, spoke on "MODIFIED STYRENE/BUTADIENE LATEXES TO THE RESCUE FOR MEETING VOC LIMITATIONS AND STILL PRODUCE QUALITY COATINGS."

The presentation focused on: modified styrene/butadiene (S/B) latexes, key benefits of S/B latexes, applications of these benefits, and formulating with S/B latexes.

Ms. Stevens said solvent emission restrictions have a significant impact on the performance of primer/sealers, semitransparent stains, and tannin blocking primers, all of which rely heavily on the formation of a tight continuous film.

According to the speaker, latex systems are excellent for reducing dependence on organic solvents. However, most latex coatings do not give very tight continuous films, thus limiting their use in some specialized high performance paints. Work done with a proprietary modified S/B latex has shown excellent moisture barrier properties, exceptional film-forming abilities, and resistance to alkali and acid, stated Ms. Stevens.

She said that this new latex has been formulated into primer/sealers, tannin

CLEVELAND............... JAN.

CPCA Joint Meeting

The meeting was attended by members of the Cleveland Paint and Coatings Association, as well as the Cleveland Society.

Members of the Technical Committee were presented Certificates of Merit for the paper, "Interlaboratory Testing of Viscosity in the Low Shear Rate Range (Below 10 sec^{-1})," presented by Technical Committee Chairman Freidun Anwari, of Coatings Research Group, Inc., at the 1988 Annual Meeting in Chicago, IL.

RICHARD J. RUCH, *Secretary*

DETROIT SOCIETY—Elected to office for 1988-89 are: Society Representative—William W. Passeno; Secretary—Liana Callas Roberts; President—Rosemary Brady; and Vice-President—Van Evener

ST. LOUIS SOCIETY—Officers for 1988-89 are as follows: Treasurer—Stan Soboleski; Vice-President—Howard Jerome; President—Robert Wagnon; James Riggins; Society Representative—John Folkerts; Educational Committee Chairman—Mike Schnurman; and Dennis Cahill

blocking primers, and semitransparent stains. The resulting paint films provide a combination of properties including: a moisture vapor barrier, enamel holdout at high PVC, caustic and acid resistance, tannin stain blocking, and substrate protection.

In conclusion, Ms. Stevens presented and explained test data and formulation parameters to show how proper use of the modified S/B latex can help paint manufacturers meet strict VOC limitations and still produce good quality coatings.

Q. Does the RAP213 display the high gloss inherent in styrene containing resins?

A. I am glad you asked this. This is inherent. The styrene monomer does provide gloss. The combination of styrene and butadiene provides the high gloss. We have work in progress that we can not present right now because it is not completed, but we find in the interior topcoat area our gloss retention is very, very good. Our data on the exterior is not really complete yet because we need at least five years of data.

James D. Hall, *Secretary*

LOUISVILLE .... JAN.

Past-Presidents' Night

Past-President Joseph V. Lococo, of Reynolds Metals Co., was presented with a 25-Year Pin for his years of dedication to the Society.

Past-Presidents in attendance included: Hardy Brindly (1954); Joseph A. Bauer, of Porter Paint Co. (1969); James A. Hoeck, of Reliance Universal, Inc. (1971); Herb Wilson, of Reliance Universal, Inc. (1975); Paul M. Nilles, of Hy-Klas Paints, Inc. (1976); Nick Lanning, of Progress Paint Co. (1978); Joseph V. Lococo (1979); J. Kirk Menefee, of Hy-Klas Paints, Inc. (1981); Phillip W. Harbaugh, of Reliance Universal, Inc. (1982); Fred E. Newhouse, of Reynolds Metals Co. (1983); John A. Lanning, of Porter Paint Co. (1984); and Joyce St. Clair, of Kentucky Partners (1986).

Ms. St. Clair gave an update on the upcoming technical seminar, to be sponsored jointly by the Society, the Louisville PCA, and Kentucky Partners. Entitled "Paint Waste Minimization," the seminar will be held on April 19 at the Executive West Hotel.

James U. Simpson, *Secretary*

PITTSBURGH .... NOV.

"Employee-Plus-Quality"

Cleveland Society President R. Edward Bish, of Jamestown Paint & Varnish Co., was the speaker for the evening. His topic was "Employee-Plus-Quality," which he presented at the 1987 Annual Meeting in Dallas, TX.

Mr. Bish's talk focused on a program for quality improvement in a coatings manufacturing company. He stated that an employee-plus-quality commitment, not managerial authority, produces measurable quality improvement in the coatings manufacturing company.

The speaker explained that many planning and training steps must be taken prior to accomplishing total quality improvement. Mr. Bish's presentation included the results of fine-tuning concepts developed in-house and those adapted from published material on this subject.

The context of Mr. Bish's quality improvement program was intended for medium and small coatings manufacturing companies. However, Mr. Bish maintained that the concepts described and the materials presented have a very real application for all manufacturing companies and their suppliers.

Carole Storme, *Secretary*

PITTSBURGH .... DEC.

"Extender Pigments"

The meeting's speaker was John G. DeVaney, of Halox Pigments, who presented a talk on "Extender Pigments, Do They Make a Difference?" Mr. DeVaney is a member of the Chicago Society.

The speaker explained that the choice of extenders does make a difference in the performance of a corrosion inhibiting latex maintenance system. According to Mr. DeVaney, extender selection is as important as the selection of the vehicle and inhibitive pigmentation. Extenders do not function universally in all systems, but are selective in their performance according to the type of latex vehicle and inhibitive pigmentation. He said developing a primer with optimum performance characteristics does not guarantee equal system performance. The concept of primer/topcoat system compatibility should be considered in all evaluations.

In conclusion, Mr. DeVaney stated that through proper extender selection, a cost

WESTERN NEW YORK SOCIETY—Serving as officers for 1988-89 are: Secretary—Marko K. Markoff; Treasurer—Diane J. Letina; President—Gerald F. Ivancie; and Vice-President—David M. Todoroff

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Snyder's Willow Grove, Linthicum, MD). GARY MORGERETH, McCormick Paint Works, 2355 Lewis Ave., Rockville, MD 20851.

BIRMINGHAM (First Thursday—Strathallen Hotel, Birmingham, England). D.A.A. WALLINGTON, Ferro Drynamels Ltd., Westgate, Aldridge, West Midlands, England WS9 8YH.

CDIC (Second Monday—Sept., Dec., Mar. in Columbus; Oct., Jan., Apr. in Cincinnati; and Nov., Feb., May in Dayton). W.E. "BUDDY" WHITLOCK, Ashland Chemical Co., P.O. Box 2219, Columbus, OH 43216.

CHICAGO (First Monday). KARL E. SCHMIDT, Premier Paint Co., 2250 Arthur Ave., Elk Grove Village, IL 60007.

CLEVELAND (Third Tuesday—meeting sites vary). RICHARD J. RUCH, Kent State University, Dept. of Chemistry, Kent, OH 44242.

DALLAS (Thursday following second Wednesday—The Harvey Hotel, Dallas, TX). RHONDA MILES, Union Carbide Corp., 2326 Lonnecker Dr., Garland, TX 75041.

DETROIT (Second Tuesday—Ukrainian Cultural Center, Warren, MI). LIANA CALLAS ROBERTS, A.T. Callas Co., 1985 W. Big Beaver, Suite 308, Troy, MI 48043.

GOLDEN GATE (Monday before third Wednesday—Alternate between Francesco's in Oakland, CA and Holiday Inn in S. San Francisco). JACK DUIS, Pacific Coast Chemical, 2424 Fourth St., Berkeley, CA 94710.

HOUSTON (Second Wednesday—Look's Sir-Loin Inn, Houston, TX). MICHAEL G. FALCONE, International Paint (USA) Inc., 17419 Little Shoe Ln., Humble, TX 77396.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). MARK ALGAIER, Hillyard Chemical, P.O. Box 909, St. Joseph, MO 64501.

LOS ANGELES (Second Wednesday—Steven's Steak House, Commerce, CA). JAMES D. HALL, Sinclair Paint Co., 6100 S. Garfield Ave., Los Angeles, CA 90040.

LOUISVILLE (Third Wednesday—Executive West Motor Hotel, Louisville, KY). JAMES SIMPSON, Reliance Universal, Inc., Resins Div., 4730 Crittenden Dr., P.O. Box 37510, Louisville, KY 40233.

MEXICO (Fourth Thursday—meeting sites vary). GERARDO DEL RIO SEC, G.B.W. De Mexico, S.A., Poniente 116 No. 576, Nueva Industrial Vallejo, 02610 Mexico, D.F., Mexico.

MONTREAL (First Wednesday—Bill Wongs Restaurant, Montreal). ROBERT BENOIT, NL Chemicals Canada Inc., 4 Place Ville-Marie, Ste. 500, Montreal, Que., H3B 4M5 Canada.

NEW ENGLAND (Third Thursday—Sheraton, Lexington, MA). ARTHUR LEMAN, Samuel Cabot Co., 100 Hale St., Nebt, MA 01950.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). ROGER P. BLACKER, Whittaker, Clark & Daniels, Inc., 1000 Coolidge St., So. Plainfield, NJ 07080.

NORTHWESTERN (Tuesday after first Monday—Jax Cafe, Minneapolis, MN). TERRY STROM, Ti-Kromatic Paints, Inc., 2492 Doswell Ave., St. Paul, MN 55108. WINNIPEG SECTION (Third Tuesday—Marigold Restaurant, Winnipeg). EDWIN R. GASKELL, Guertin Bros. Coatings & Sealants Ltd., 50 Panet Rd., Winnipeg, MB, R2J OR9 Canada.

PACIFIC NORTHWEST (PORTLAND SECTION—Tuesday following second Wednesday; SEATTLE SECTION—the day after Portland; BRITISH COLUMBIA SECTION—the day after Seattle). JOHN BERGHUIS, NL Chemicals Canada Inc., 3450 Wellington Ave., Vancouver, B.C., V5R 4Y4 Canada.

PHILADELPHIA (Second Thursday—Williamson's GSB Bldg., Bala Cynwyd, PA). CHRISTOPHER H. HUHN, Loos & Dilworth, Inc., 61 E. Green Ln., Bristol, PA 19007.

PIEDMONT (Third Wednesday—Ramada Inn Airport, Greensboro, NC). GARY L. WATERS, Sadolin Paint Products, Inc., P.O. Box 669, Walkertown, NC 27051.

PITTSBURGH (Second Monday—Montemurro's Restaurant, Sharpsburg, PA). CAROL STORME, Valspar Corp., 2000 Westhall St., Pittsburgh, PA 15233.

ROCKY MOUNTAIN (Monday following first Wednesday—Holiday Inn North, Denver, CO). BRUCE REHMANN, Komac Paint, 1201 Osage St., Denver, CO 80204.

ST. LOUIS (Third Tuesday—Salad Bowl, St. Louis, MO). TERRY GELHOT, Rockford Coatings Co., 1825 Avenue H, St. Louis, MO 63125.

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). JAMES R. SALISBURY, Union Carbide Corp., 2043 Steel Dr., Tucker, GA 30084.

TORONTO (Second Monday—Cambridge Motor Hotel, Toronto). GERRY PARSONS, DeSoto Coatings Ltd., 895 Rangeview Rd., Mississauga, Ont., L5E 3E7 Canada.

WESTERN NEW YORK (Third Tuesday—meeting sites vary), MARKO K. MARKOFF, 182 Farmingdale Rd., Cheektowaga, NY 14225.

effective high performance coating can be achieved.

CAROLE STORME, *Secretary*

ST. LOUIS .... NOV.

"Motivation"

Vice-President Howard Jerome, of Mozel Equipment Co., was recognized for receiving the George Baugh Heckel Award and winning second prize in the Ernest T. Trigg Award Competition, at the 1988 Annual Meeting in Chicago, IL.

The Heckel Award is presented each year at the Annual Meeting of the Federation to the individual (or individuals) whose contribution to the general advancement of the Federation's interest and prestige has been outstanding. The Trigg Award honors the Society Secretaries who furnish to the JOURNAL OF COATINGS TECHNOLOGY the most interesting reports on their regular meetings. This award also is presented at the Annual Meeting.

Tom Fitzgerald, Sr., of Sterling Lacquer Mfg. Co., was presented with a 25-Year Pin in recognition of his dedicated years of service to the Society.

The guest speaker was Michael Shaner, of St. Louis University, who spoke on "MOTIVATION—THE KEY TO PRODUCTIVITY."

Dr. Shaner's talk covered four basic principles, including: (1) All people are motivated to do something; (2) Everyone is motivated for their own reasons; (3) Motivation comes from within, not from others; and (4) You can create a motivational environment, but will only motivate some, because different things motivate different people.

According to Dr. Shaner, several things may make people work harder: money (e.g., commission for salespersons); job satisfaction due to content of job; desire to achieve and do good at something; and power of having authority or knowledge of something.

In conclusion, Dr. Shaner said that positive reinforcement is needed when doing a job. Also, through motivation, it is possible to get people to do something you want them to do by creating the right environment.

TERRY GELHOT, *Secretary*

ST. LOUIS .... JAN.

"Technology from the Laboratory To the Marketplace"

The Federation's Educational Committee videotape, "The Choice," a 20-minute film to encourage high school juniors and seniors to consider a career in the coatings industry, was shown at the conclusion of the meeting.

Society member James Stouffer, of University of Missouri-Rolla, was the meeting's speaker. His topic was "TECHNOLOGY FROM THE LABORATORY TO THE MARKETPLACE."

Dr. Stouffer has tried to encourage area high school teachers to promote careers in the coatings industry to their students. During his presentation, he showed slides of Missouri-Rolla's laboratories, staff, students, equipment, campus, experiments, etc. Also, the speaker explained some of the projects taking place at Missouri-Rolla.

Dr. Stouffer said problems in the marketplace are solved when people have ideas. These ideas are teamed up with technology and planning to net the outcome of products. The products, in turn, not only solve an existing problem but can also create new jobs.

In conclusion, Dr. Stouffer said many companies come to Missouri-Rolla's program with their ideas and problems which create a lot of lab work and projects for the students.

TERRY GELHOT, *Secretary*

TORONTO .... JAN.

Subcommittees

President Hans Wittman, of BASF Canada Ltd., will establish a Nominating Committee to elect a Secretary for 1989-90.

Two subcommittees are being formed to initiate research papers to be presented at the 1991 Annual Meeting in Toronto. One subcommittee will represent the Society and the other subcommittee will represent a joint project with the Montreal Society.

GERRY PARSONS, *Secretary*

WESTERN NEW YORK .... DEC.

"Polyester Oligomers"

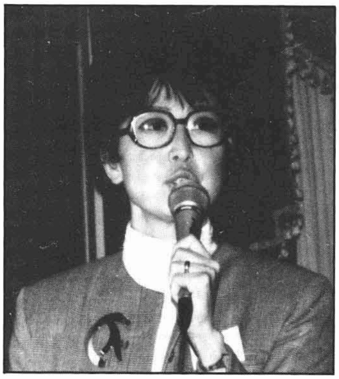
Society member Richard M. Benton, of NL Chemicals, presented a talk on "POLYESTER OLIGOMERS OF NARROWED MOLECULAR WEIGHT DISTRIBUTION."

Mr. Benton's data focused on lowering VOC in paint formulas—baking enamels cured 20 min at 350°F and the differences between theoretical and determined VOC. He said to obtain the best pigment dispersability and thereby have good flow and leveling, higher gloss, very good DOI, and lower VOC, cogrinding resins were preferred over DMEA and DOSS additives.

Q. What is currently being used in the coatings industry?

A. The co-grinding method and preferably with higher AV resins.

MARKO K. MARKOFF, *Secretary*



GUEST SPEAKER—Violet Stevens, of Dow Chemical, gives the technical presentation at the January meeting of the Los Angeles Society

Elections

BALTIMORE

Active

CHODNICKI, RICHARD C.—Van Horn, Metz & Co., Inc., Baltimore, MD.
LI, CHIN-TAI—By-Chem, Williamsport, MD.
OBITZ, TY A.—Trace Laboratories, Linthicum, MD.

Associate

PREVOZNAK, STEPHEN J.—Colloids, Inc., Newark, NJ.
STUDEBAKER, R. JAY—Eastman Chemical Co., Oxford, PA.
TAKESIAN, JANE B.—Callahan Chemical Co., Palmyra, NJ.

BIRMINGHAM

Active

O'SHEA, JOHN J.—Rollacolour Ltd., Bloxwich, West Midlands.
VICKERMAN, RICHARD J.—Ciba-Geigy (UK) Ltd., Duxford, Cambridge.

CDIC

Active

BOMBEN, EMANUELE L.—D&L Paint Co., Inc., Liberty, IN.
LONG, VERNON E.—Hanna Chemical Coatings Co., Columbus, OH.

Associate

HATHAWAY, JULIE A.—NL Chemicals, Columbus, OH.
STUBBERS, NEIL J.—Deeks & Co., Cincinnati, OH.

CLEVELAND

Active

BOATWRIGHT, JOSEPH H.—Consultant, North Ridgeville, OH.
CHOKSHJ, KALPESH R.—Sherwin-Williams Co., Cleveland, OH.
WALKER, JOSEPH K.—Sherwin-Williams Co., Cleveland.

Retired

DREKA, GEORGE B.—Cleveland Heights, OH.

DALLAS

Active

BRIGHT, WILLIAM M.—Sherwin-Williams Co., Garland, TX.
MICHALEWICZ, LEO W.—Proko Co., Inc., Mesquite, TX.

Associate

LEISER, JEFFREY S.—ICI Americas Inc., Dallas, TX.
TAIT, ROBERT W.—Angus Chemical, Irving, TX.

DETROIT

Active

BAIR, DANIEL W.—Ziebart International Corp., Redford, MI.
BEAGLE, MAUREEN T.—Ziebart International Corp., Redford.
CALLEJA, JOHN A.—Kay Auto Graphics, Auburn Heights, MI.
DANTIKI, SUDHAKAR—BASF Corp., Whitehouse, OH.
DEVARENNE, BRIAN J.—Dow Corning Corp., Midland, MI.
DOLATO, RICHARD M.—Morton Thiokol Inc., Belleville, MI.
GENTLE, CINDY L.—Morton Thiokol Inc., Belleville.
HALLOCK, JOHN S.—BASF Coatings & Inks, Southfield, MI.
KLEIN, BARBARA A.—DuPont Co., Mt. Clemens, MI.
KORECK, JOSEPH C.—Bee Chemical Co., Belleville.
MITRA, SUBAL K.—Ziebart International Corp., Redford.
MOSZCZENSKI, MARK A.—BASF Coatings & Inks, Mantramck, MI.
NAGATA, ISAO—DuPont, Co., Troy, MI.
NEWTON, DAVID L.—BASF Coatings & Inks, Whitehouse.
PLAZA, MATTHEW J.—PPG Industries, Inc., Troy.
WHITE, ROOSEVELT JR.—Ziebart International Corp., Redford.
WHITT, DONALD W.—PPG Industries, Inc., Union Lake, MI.

Associate

COLLINS, RUSSELL L.—American Cyanamid Co., Southfield, MI.
KURZ, CATHY—Reichhold Chemicals, Inc., Ferndale, MI.

LEISER, DAVID M.—Harry Holland and Son Inc., Royal Oak, MI.
LEVINE, MICHAEL H.—Pennwalt Corp., Farmington Hills, MI.
RAULS, THOMAS E.—Cargill, Inc., Carpentersville, IL.
SHERBAN, TERENCE A.—Harry Holland and Son Inc., Royal Oak.

KANSAS CITY

Active

FRAZIER, RANDY—Cook Paint & Varnish Co., Kansas City, MO.
YANKEE, SAMUEL D.—Heritage Environmental Services, Kansas City.

Associate

MEYER, TAMARA L.—Cemsac Chemicals Corp., Chesterfield, MO.

LOS ANGELES

Active

BEACH, WILLIAM J.—Spraylat Corp., Los Angeles, CA.
CHON, JOHN Z.—Spraylat Corp., Los Angeles.
GLENDRANGE, MARK M.—Mer-Kote Products, Torrance, CA.
HIGA, MYINT LILY—Old Quaker Paint Co., Carson, CA.
LINK, TERRY M.—Cardinal Industrial Finishes, S. El Monte, CA.
LIVA, FREDERICK L.—Sherwin-Williams Co., Commerce, CA.
LOPEZ, EDDIE—Cardinal Industrial Finishes, S. El Monte.
MITRA, ARUP R.—Pure-Cote Corp., Pacoima, CA.
SCARLATA, DANA L.—WLS Coatings, Los Angeles.
SREMBA, SCOTT E.—Cardinal Industrial Finishes, S. El Monte.
STARKES, EDWARD J.—Cardinal Industrial Finishes, S. El Monte.

Associate

ADKINS, ADRIAN S.—Schoofs, Inc., Moraga, CA.
DARDEN, JEROME W.—Texaco Chemical Co., Thousand Oaks, CA.
FREEMAN, PHILIP M.—Rose Cooperage, Montebello, CA.
LORENZ, WILL R.—ICI Polyurethanes, Rancho Santa Marqarita, CA.

LOUISVILLE

Active

ELLIOTT, DONALD R.—United Catalysts, Inc., Louisville, KY.
ENGSTROM, PATRICIA—United Catalysts, Inc., Louisville.
JARBOE, DAVID E.—Engelhard Corp., Louisville.
SNELLING, HARVEY W.—Porter Paint Co., Louisville.

Associate

ANDREWS, ROBERT P.—Rohm and Haas Co., Louisville, KY.
BERTOLINO-GREEN, JACKIE—Louisville Coatings, Scottsburg, IN.
GERHARDT, GREGORY E.—S.C. Johnson & Sons, Cincinnati, OH.
HARTLEIN, DANIEL T.—Betz MetChem, LaGrange, KY.
HELD, WILLIAM L.—Paul Uhlich & Co., Cincinnati.
LEE, BRADFORD A.—Hercules Inc., Wilmington, DE.
MECKSTROTH, SANDRA C.—Aries Software Corp., Louisville.
PACKER, WESLEY L.—Cyprus Industrial ML., Munroe Falls, OH.
PAYNE, PAUL C.—Union Carbide Corp., Louisville.
RYAN, JEFF S.—C.L. Zimmerman Co., Louisville.
SURIANI, DAVID M.—BASF Corp., Marietta, GA.
WELCH, BERNARD M.—PPG Industries, Inc., Delaware, OH.

TRACTON, ARTHUR A.—John L. Armitage & Co., Parsippany, NJ.

Associate

BRADY, WILLIAM J.—Cabot Corp., Edison, NJ.
FENSTERMAKER, TIGHMAN—G.J. Chemical Co., Inc., Newark, NJ.
HAYDEN, WILLIAM D.—Thor Chemicals, Inc., Norwalk, CT.
LAW, CHARLES T.—Charles A. Wagner Co., Philadelphia, PA.
McCANN, MICHAEL J.—BP Chemicals Americas Inc., Rye, NY.
MERRITT, GEORGE E.—Unocal Chemicals Div., Clark, NJ.
RICE, THOMAS A.—C. Withington Co., Inc., Lynbrook, NY.
TELFORD, VALERIE M.—Drew Chemical Corp., Boonton, NJ.

NORTHWESTERN

Active

CRAWFORD, SCOTT W.—Diamond Vogel Paint, Minneapolis, MN.
LUNSFORD, DUANE A.—3M Co., Jordan, MN.

Associate

DWORSKY, JOE A.—Consolidated Container Corp., Minneapolis, MN.
KLOSTER, JOSIE A.—Unocal Chemicals Div., St. Paul, MN.

TORONTO

Associate

HOOK, DAVID A.—R.T. Vanderbilt Co., Inc., Etobicoke, Ont.

Retired

WRIGHT, GEORGE E.—Scarborough, Ont.

CLASSIFIED ADVERTISING

NEW YORK

Active

ALLI, RONALD R.—Mercury Paint Corp., Queens Richmond Hill, NY.
BRODY, DONALD E.—Pyrolac Corp., Hawthorne, NJ.
FALK, JEFFREY A.—R.T. Vanderbilt Co., Inc., Norwalk, CT.
FOX, LEONARD I.—Craig Adhesives Co., Newark, NJ.
KAPILOW, LORRAINE—CIBA-GEIGY Corp., Ardsley, NY.
MAHON, WILLIAM F.—Craig Adhesives Co., Newark.
McGRATH, JAMES M.—Georgia Kaolin Co., Springfield, NJ.

WESTERN NEW YORK

Active

CORLESS, JOANNE L.—NL Chemicals, Buffalo, NY.
HAINES, MARK S.—Essex Specialty Prod., Jamestown, NY.
RYMARCZYK, MARK J.—Pratt & Lambert, Inc., Buffalo.
TROUTMAN, MARK D.—Essex Specialty Prod., Jamestown.

Associate

CAVAGNARO, ERNEST E.—FBC Corp., Lancaster, NY.
JORDAN, DENNIS P.—Palmer Supplies Co., Williamsville, NY.

Birmingham

(May 4)—60th Annual General Meeting.

Dallas

(Apr. 13)—"New Developments in Vinyl Resins"—Tom Ginsburg, Union Carbide Corp.

Golden Gate

(Apr. 17)—"Rheological Measurements as a Guide to Additive Performance"—Marvin Schnall and James Jodrey, Troy Chemical, Holiday Inn.

(May 15)—"Carbon Blacks—Pigments for Coatings, Production, Properties, Application, Dispersion"—Maria Nargiello, Degussa Corp., Francesco's Restaurant.

(June 19)—Manufacturing Committee Program. Holiday Inn.

Houston

(Apr. 12)—"New Developments in Vinyl Resins"—Tom Ginsberg, Union Carbide Corp.

(May 10)—Speaker to be announced.

Kansas City

(May 11)—Education Night.

Los Angeles

(Apr. 12)—"Rheological Measurements as a Guide to Additive Performance"—Marvin Schnall and James Jodrey, Troy Chemical Corp.

(May 10)—"Carbon Blacks—Pigments for Coatings, Production, Properties, Application, Dispersion"—Maria Nargiello, Degussa Corp.

New York

(Apr. 11)—"Novel New Uses for Isoparaffins"—Mark Danti, Exxon Chemical Co.

(May 9)—Past Presidents' and PaVaC Awards Night.

Pacific Northwest— Portland, Seattle, & Vancouver Sections

(Apr. 18-20)—"Rheological Measurements as a Guide to Additive Performance"—Marvin Schnall and James Jodrey, Troy Chemical Corp.

(May 16-18)—"Carbon Blacks—Pigments for Coatings, Production, Properties, Application, Dispersion"—Maria Nargiello, Degussa Corp., Portland Motor Inn.

Philadelphia

(Apr. 29)—Awards Night.

(May 11)—"ASTM Methods for VOC Determination"—Hiroshi Fujimoto, Inmont Corp.

Technical Committee Meetings

Philadelphia Society Technical Committee Meetings are held on the first Thursday of each month at the Schwarzwald Inn, Second St. & Olney Ave., Philadelphia.

(May 1)—Technical Seminar.

(June 8)—Diffusion Project, First Phase, Wrap-up Meeting.

Piedmont

(Apr. 19)—"Federation Night"

(May 17)—"Color Nonuniformity—Causes and Cures"—Marvin Schnall, Troy Chemical Corp.

(June 21)—Subject to be announced—Dan Dixon, Engelhard Corp.

Rocky Mountain

(Apr. 10)—"Rheological Measurements as a Guide to Additive Performance"—Marvin Schnall and James Jodrey, Troy Chemical Corp.

(May 8)—"Carbon Blacks—Pigments for Coatings, Production, Properties, Application, Dispersion"—Maria Nargiello, Degussa Corp.

The Coating Polymers and Resins Division, of Reichhold Chemicals, Inc., Pensacola, FL, has announced changes in the division. **Richard A. Martin** has been named Director—Technical Services and Applications and **Billy K. Winters** has been appointed Product Manager—Coating Resins. Mr. Martin is a member of the Philadelphia Society and Mr. Winters is a member of the Southern Society.

Also, **Fred G. Howard** and **Richard E. Judd** have joined the division as Technical Sales Representatives. Mr. Howard will be based at Reichhold's Azusa, CA, facility and Mr. Judd will work out of the company's plant in Elizabeth, NJ. Mr. Howard is a member of the Los Angeles Society.

Henkel Corp., Gulph Mills, PA, has promoted **Water H. Neumann** to Senior Vice President. In his new position, Mr. Neumann will concentrate on the business development for fatty alcohols in North America. He has over 25 years of experience with the company in a wide variety of executive positions.

Judith C. Giordan has been appointed Vice President of Technology for Henkel. She will lead the new Corporate Research and Development Center in Ambler, PA. Ms. Giordan most recently served as a Senior Technical Supervisor at Alcoa Research Laboratories.

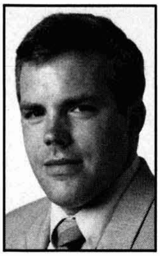
Also, the Henkel Polymers Division recently added several new employees to its staff of technical and sales/marketing personnel. The appointments are: **Sam Patel,** Senior Development Chemist; **Bob Moon,** Development Chemist—Civil Engineering Dept.; **Cory Krobert,** Marketing Development Representative—Adhesives and Industrial Resins Division; and **Deb Padley,** Senior Technical Services Representative.

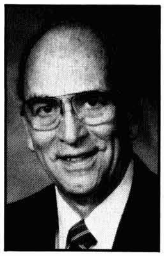
Wesley A. Coppock, Sr., a member of the coatings industry for 28 years, has retired from the Milton Roy Co. Mr. Coppock, a member of the Piedmont Society, will work for Carolina Color Services, Charlotte, NC. He will handle consulting and training services to various industries including training courses in color control technology from top management to technician levels, in various major cities in the U.S. and Canada.

Zinchem, Inc., Somerset, NJ, has named **William Brown** General Manager. Mr. Brown has extensive experience in the graphic arts field including various technical and management positions.


F.G. Howard


J.C. Giordan


D.R. Baker


W.D. Gallentine

McWhorter, Inc., Carpentersville, IL, has appointed **Daniel R. Baker** Quality Assurance Manager. He will be responsible for all five resin plants in quality training, the use of Statistical Process Control in all aspects of the company's business, and vendor certification. Mr. Baker is a member of the Chicago Society.

W.D. "Don" Gallentine has been appointed Supervisory Sales Consultant in Michigan and northwestern Ohio for Boehle Chemicals, Inc., Southfield, MI. Mr. Gallentine previously was the owner of George E. Moser & Son, Inc. He is a member of the Detroit Society.

The Occidental Chemical Corp., Dallas, TX, has announced the winners of its Inventor and Publication Awards for 1988. **Paul O. Hong** and **Raymond C. DeWald** have been named recipients of the Inventor-of-the-Year Award. Dr. Hong and Mr. DeWald, both from OxyChem's PVC Resins and Compounds Division, have been recognized for their evaluation and scale-up of a novel method for streamlining the production of PVC dispersion resins.

The Technology Publication Award went to **Neil J. O'Reilly, Henry C. Lin,** and **William S. Derwin,** from OxyChem's Corporate Technology Department. Their paper, "Optically Pure 1,2,3,4-Tetrahydro-3(s)-isoquinolinecarboxylic Acid and Asymmetric Hydrogenation Studies Related to its Preparation," was judged the most significant contribution by OxyChem authors to the field of science and technology.

Maroon Inc., Cleveland, OH, has announced three key managerial appointments: **Mark A. Maroon,** Director—Marketing; **Mark Reichard,** Director—Sales; and **Cheryl Vercillo,** Office Manager.

Mr. Maroon will be responsible for all product information and activity which includes direct liaison with raw material manufacturing facilities, customer service, and technical services. He is member of the Cleveland Society.

Mr. Reichard will oversee all sales for the company's full range of chemical raw materials, containers, and processing equipment.

As Officer Manager, Ms. Vercillo will handle the sales order department, warehouse coordination, transportation, and office and warehouse personnel.

Charles B. Edwards Co., Minneapolis, MN, has named **Peter Marconi** Technical Sales Representative. He is responsible for technical sales in the northeastern U.S. Mr. Marconi has over 22 years of combined experience in the thermoplastics and colorants industries.

Ronald H. Yocum has been elected Vice President of Quantum Chemical Corp., and President of Quantum's USI Division. He was previously Group Vice President—Research and Development, for the division. Dr. Yocum replaces **James F. Schorr** who retired.

The DuPont Co., Troy, MI, has named four people to new positions in its Automotive Finishes Organization, Including: **Edward J. Donnelly, Jr.,** General Sales and Marketing Manager—Automotive Finishes; **Larry C. Crawley,** Group Manager—Marketing on the Ford Account; **John J. Purcell,** Group Manager—Marketing on the General Motors Account; and **Charles M. Van Paemel,** Technical Marketing Manager—Foreign Accounts.

Mr. Crawley is member of the Detroit Society.

Philip Farina has joined ICI Americas Inc., Wilmington, DE, as Midwest Field Sales Manager—Surfactants, with ICI Specialty Products. He will work out of Columbus, OH. Mr. Farina is a member of the CDIC Society.

ICI Specialty Chemicals has named **Craig Aiken** Industry Manager—Industrial and Agricultural Surfactants Business. He will oversee all marketing activity for the Industrial, Agricultural, and Formulated Metalworking Fluid Businesses. Mr. Aiken previously was an Industry Specialist—Agricultural Surfactants Group.

Fitz Chem Corp., Elmhurst, IL, has promoted **Michael L. Mack** to the newly-created position of Operations Manager. He will be responsible for all computer networking functions, customer service, inventory control, bookkeeping, and office management. Mr. Mack is a member of the Chicago Society.

Wolfgang Gunter has joined Hercules Incorporated, Wilmington, DE, as Technical Supervisor—Research. Dr. Gunter will be based at the company's Jefferson, PA, plant. He brings broad international experience in marketing, new business development, and technology advances to his new position.

In other news, Hercules has promoted **John E. Carney** to Technical Sales Representative—Resins Field Sales Group. His new location will be the Western District office in Los Angeles, CA. Replacing Mr. Carney is Technical Representative **Steven M. Cash.** Mr. Cash will work out of the Resins Distributor and Technical Sales Group in Wilmington.

Steve Murdock has been appointed to the newly-created position of Product Manager—Pigments, for The O. Hommel Co., Pittsburgh, PA. His responsibilities include development and marketing of pigments to the ceramic, porcelain enamel, and glass industries. Mr. Murdock will work out of the company's headquarters in Pittsburgh.

The Georgia Kaolin Co., Union, NJ, has appointed **Edward J. Sare** Director—Research, Specialties. Dr. Sare previously was employed as Senior Manager—Product/Process Development for the Chemical Group at PPG Industries, Inc.

Velsicol Chemical Corp., Rosemont, IL, has promoted **Dennis T. Leu** to Vice President—Chemical Group. He will assume responsibility for the Group's domestic sales and worldwide product management activities. Mr. Leu formerly served as Director—Sales and Marketing.

The Electrometallics Department in the Engineered Materials Division, of Engelhard Corp., Edison, NJ, has named **Linda J. Mayer** Manager—Technical Service. Ms. Mayer will manage technical service activities for precious metal electroplating chemicals in North America. She formerly worked in a variety of marketing and research and development positions for Oxy Metal Industries.

Three appointments have been announced by Morton Thiokol, Inc., Chicago, IL. The Specialty Chemicals Group has named **Thomas Casey** Director—Human Resources. He is responsible for managing employee compensation and services and nonunion employee relations.

The Morton Chemical Division has appointed **Mark J. Nowak** Marketing Manager—Specialty Polymers Group. He will oversee the sales and marketing functions within the Group for the North American construction industry.

M. Reginald Horne was recently promoted to Product Manager—Coatings, for the Bee Chemical Co., Lansing, IL. His duties include the product commercialization of interior automotive coatings, and television coatings and related sales, customer support, and price structuring on a national basis.

ERRATA

In the January 1989 issue of the JCT, **Lawrence P. Magier** was incorrectly affiliated with Bruning Paint Co. Mr. Magier was recently named Manager of the Microbiology Laboratory for Troy Chemical Corp., Newark, NJ. He has been with Troy since 1983 and most recently served as a Project Manager. We apologize for this error.

Two promotions within the Technical Service Laboratory staff of C.P. Hall Co., Chicago, Il, have been announced. **Stephen E. O'Rourke** has been named Technical Service Supervisor—Aqueous Systems. He is responsible for two lines of rubber process coatings as well as customer service and applications development in the adhesives and coatings areas.

Ronald D. Svoboda has been promoted to Technical Service Supervisor—Plasticizer Systems. He will handle a line of dry liquid concentrates, PVC plastisols, and other compounded products, as well as plasticizer applications development and product support for rubber and PVC.

Rick Weigman has been appointed Territory Manager—Northcentral Region, for Raabe Corp., Milwaukee, WI. His territory will include Ohio, Michigan, West Virginia, western Pennsylvania, and western New York. Mr. Weigman joined Raabe in 1986 and most recently worked as a Sales/Service Representative at the company's corporate facility in Milwaukee.

Kevin Hershfield has been appointed Sales Representative of the Cleveland Pigment and Color Co., Akron, OH. He is responsible for promoting the company's line of distributed products and custom processing capabilities of the coatings, plastics, ink, and rubber industries.

Colwell/General, Inc., Minneapolis, MN, has named **Donald S. Woelfel,** Vice President/Technical Director; **John Abbott,** Vice President—Sales, Color Cards; **Larry G. Carl,** Vice President—Manufacturing, Color Cards; and **David L. Brayton,** Vice President—Manufacturing, Color Systems.

NL Chemicals, Hightstown, NJ, has promoted **Joseph Maas** to Marketing Manager—Resin Products and **Alfred J. Whitton** to Market Manager—New Products. Mr. Maas will be in charge of marketing of all resins and oil seed products. Mr. Whitton will oversee the marketing and sales of all new specialty chemicals products.

The Business Development Group has added two new staff members through promotion. **Patricia Mayer** has been named Business Analyst and **John Falsone** has been appointed Project Manager. Ms. Mayer most recently served as a Product Development Chemist—Technology Department. Mr. Falsone formerly was Specialty Products Manager for the central sales region.

Vincent Nocito has been appointed to the newly-created position of Vice President—Technology for ANGUS Chemical Co., Northbrook, IL. He will oversee research and experimentation to advance the technological position of the company and all of its subsidiaries. Dr. Nocito previously was Director—Organic Synthesis and acting Director—Research and Development in the Technical Center.

In other news, **John F. Alderman** has been promoted to Director—Research and Development. He will direct the efforts of the Technical Center toward ensuring technical support of the company's core business. Dr. Alderman formerly was Director—Biocide Development.

The Ashland Chemical Co., Columbus, OH, has announced leadership changes in several of the company's divisions, including: **J. Thomas King,** Vice President and General Manager—IC&S Division; **Pete M. Bokach,** Vice President and General Manager—Composite Polymers Division; and **Michael D. Killian,** Vice President and General Manager—Petrochemical Division.

David R. Wallis has been named Director—Commercial Development, for PPG Industries, Inc., Pittsburgh, PA. His duties include identification and development of business opportunities, comprising acquisitions and internal growth ventures. Mr. Wallis previously had been Chemicals Group Manager—Business Development.

Witco Corp., New York, NY, has announced the election of **Michael D. Fullwood** to Corporate Vice President and Treasurer. Mr. Fullwood joined Witco in 1987 as a Senior Attorney in the Legal Department. He has 17 years of experience in corporate and international law within the chemical and oil industries.

Tom McGann will head the newly-created Binks Protective Equipment Division, of Binks Manufacturing Co., Franklin Park, IL. He will work closely with the company's national sales organization, branches, and distributor network. Mr. McGann has worked in the National Standard Equipment Sales Department since 1985.

Jeff P. Lake has been promoted to Vice President and General Manager of Liquid Carbonic Industrial/Medical Corp., a subsidiary of Liquid Carbonic Industries Corp., Chicago, IL. Mr. Lake will oversee all departments within the company's bulk operations. He most recently served as Vice President/National Sales Manager.

Colorcon, Inc., West Point, PA, has named **Wayne R. Salkeld** Vice President—Marketing. He will have overall responsibility for the sales, marketing, advertising, customer service, and technical service departments. Prior to joining Colorcon, Mr. Salkeld was employed by Sandoz Chemical Co. as Director—Specialty Chemicals.

Carl F. Walz has been hired as Marketing Manager—Industrial and Electrical Divisions of CRC Chemicals, Warminster, PA. He will be responsible for marketing the company's complete line of lubricants, cleaners, degreasers, and corrosion protection chemicals. Mr. Walz has over nine years of experience in the sale and marketing of industrial products.

The Degussa Corp., Ridgefield Park, NJ, has appointed **Terence M. Bowerman** Vice President—Marketing, for all domestic and imported fumed silicas. Mr. Bowerman formerly served as Director of Marketing for Aerosil Fumed Silicas.

W. David Wright was honored with the 1989 Inter-Society Color Council (ISCC) Godlove Award for his contributions to the field of color. The award was presented during the ISCC's Annual Meeting on April 10 in Chicago, IL.

The award is presented every other year to a member or former member of the ISCC for contributions to the field of color. Dr. Wright is the 18th recipient of the Godlove Award.

Dr. Wright's interests include color vision, color measurement, color education, color in art, and many other related areas. His first major contribution was an experimental determination of the color matching characteristics of human observers. CIE 1931 Standard Observer remains, 58 years later, as the basis of most colorimetry, both scientific and industrial.

Before his retirement in 1971, Dr. Wright, whose name is virtually synonymous with color science, held the position of Professor of Applied Optics at Imperial College, University of London, England. He is the author of five books and many scientific papers, and even after his retirement, he has remained active in writing and teaching.

The Godlove Award Fund was established by Mrs. Margaret N. Godlove in memory of her husband, Dr. I.H. Godlove.

Obituary

Robert E. Minucciani, retired from The Glidden Co., died on February 17.

Mr. Minucciani attended South San Francisco High School and Santa Clara University. He served in the Navy in World War II and joined H.P. Fuller (now The O'Brien Corp.) in 1948. Later, Mr. Minucciani joined The Glidden Company as Technical Director.

Chairman of the Environmental Control Committee of the Federation of Societies for Coatings Technology, Mr. Minucciani was instrumental in establishing the monthly *Regulatory Update* section featured in the JOURNAL OF COATINGS TECHNOLOGY. His expertise in environmental affairs led to his position as Northern California coordinator for the State Affairs program of the National Paint and Coatings Association.

A Past-President of the Golden Gate Society, Mr. Minucciani served as Chairman of the Biennial Western Coatings' Societies Symposium and Show. In addition, he was Chairperson of the Environmental Committee of the Golden Gate Society. Mr. Minucciani was Vice President of the Golden Gate Paint and Coatings Association and also served as Chairman of its Environmental Committee.

Additional achievements include serving as Past-President of the Bay Area League of Industrial Associations and the Golden West Section of the Air & Waste Management Association, and a Past-Chairman of the Hazardous Materials Conference.

He is survived by his wife, Shirley A.; a daughter, Cynthia L. Traverso; two sons, Steven M. and Richard A.; and five grandchildren.

The Golden Gate Society for Coatings Technology has established a scholarship in his honor.

Robert F. Hall, former Technical Director of Calcium Products Division of Georgia Marble Co., died on December 15.

Active for many years in paint research, Mr. Hall was a Past-President of the Southern Society for Coatings Technology.

Survivors include a daughter, Susan E. White, and a son, Sherwood Hall.

E. Colin Baldwin, 80, died January 21, in Savannah, GA. He was a former Chairman and Chief Executive Officer of The Sherwin-Williams Co.

Mr. Baldwin graduated from Williams College in 1930 and received the M.B.A. Degree from Harvard University in 1932.

He began his career with Sherwin-Williams in 1934 as a Sales Analyst. In the following years, Mr. Baldwin held various positions in market research, sales promotion, and advertising, and was Assistant to the President. In 1956, he was named Executive Vice President of Sherwin-Williams Co. of Canada, Ltd., in Montreal. In 1958, Mr. Baldwin became President of Sherwin-Williams Canada and Chairman of the Board in 1964.

He returned to Cleveland in 1959 and was named Vice President and General Manager. Mr. Baldwin was elected President in 1960 and Chairman of the Board and Chief Executive Officer in 1970. He retired as Chairman in 1974, but continued on the Board of Directors until 1979.

He received the Industry Statesman Award, presented by the National Paint and Coatings Association, in 1973.

Dispersion, Rheology, and Adhesion Short Courses The Focus of Kent State University Spring Schedule

The Rheology and Coatings Laboratory at Kent State University (KSU), Kent, OH, has announced its short course schedule for the spring.

The three programs offered by KSU are: "Applied Rheology for Industrial Chemists"—April 24-28; "Dispersion of Pigments and Resins in Fluid Media"—May 8-12; and "Adhesion Principles and Practice for Coatings and Polymer Scientists"—May 22-26.

An overview of the scientific fundamentals for each course subject will be presented followed by the application of these principles to practice. All three programs are designed for research, development, and quality control personnel with interests in coatings, adhesives, elastomers, inks, and composites.

The "Rheology" course will introduce basic concepts followed by discussions on various rheological instruments and their selection for processing and end use problems. The rheological measurements for coatings and composites by TMA, DMA, and stress rheometry will be presented. The application of rheology to high-solids and thermoset coatings, thermoplastic melts, latexes, dispersions, and cure characterization will be described.

The "Dispersion" program will contain subjects on the surface chemistry and physics relative to dispersion, dispersant selection, and measurement of quality and particle size of dispersions. The mechanics of dispersion related to pigments, resins, and latexes in classic solvent and water media are presented by various experts. Types of dispersion equipment such as mixers, and ball and pebble, horizontal, sand, and related small media mills and their proper selection will be presented.

The "Adhesion" class lecturers will give principles of surface chemistry relative to adhesion and present rheology and fracture mechanics of glassy and elastomeric adhesives. Surface preparation, plasma treatment of plastics, selection of adhesion promoters, and surface analysis techniques to improve and understand adhesion will be described. Other topics include: rubber-to-metal and polymer-to-metal bonding; tack; surface chemistry of release corrosion; and fundamental aspects of coatings adhesion. The final lecture will contain information on adhesive application.

Additional details can be obtained by contacting Carl J. Knauss, KSU, Chemistry Dept., Kent, OH 44242-0001.

Coatings and Health Focus Of Northwestern Symposium

"Coatings and Your Health" was the theme of this year's 18th Annual Symposium sponsored by the Northwestern Society for Coatings Technology. The Seminar was held on March 7, at the Marriott Inn, in Bloomington, IN.

The symposium's program included the following presentations:

"Toxicology and Industrial Hygiene of Isocyanates"—Mary Ann Brost, of Mobay Corp.;

"Toxicology and Industrial Hygiene of Pigments"—Philip Webb, of BASF Corp.;

"Ergonomics: Maximizing Job Safety, Efficiency and Productivity"—David Sweziek, of Liberty Mutual Insurance; and

"Minnesota Poison Control Center, Hazardous Information Services, Medical Response Hotline, and the Chemical Products Industry"—Leo J. Sioris and Phil Scfarcy.

Members of this year's Northwestern Society Symposium Committee include: Chairman H. Mustapha Bacchus, of Valspar Corp.; Richard L. Fricker, of Valspar Corp.; Eric Habeck, of Valspar Corp.; Joan B. Lamberg, of Horton-Earl Co.; and Charleen Heinke.

Western New York Society Sponsors Continuing Educational Programs

The Continuing Educational Program of the Western New York Society for Coatings Technology has taken the challenge of promoting the coatings industry to high school and college students in their community.

The Society Educational Committee awarded two $400 scholarships each at their October meeting. The recipients of the scholarships were: Carol A. Golinski, a freshman at SUNY-Buffalo, NY, daughter of Michael P. Golinski, of Pratt & Lambert, Inc.; and Barry Foss, a junior at SUNY-Plattsburgh, NY, son of Richard A. Foss, of NL Chemicals.

Since 1974, $2,700 in scholarships has been awarded by the Society to full-time students whose parents or guardians are members of the Western New York Society.

The Educational Committee and the Annual Scholarship Program Committee have committed $600 in prize money for the best projects related to the coatings industry at the Western New York Congress Fair held in March.

Letters promoting the Federation Educational Committee videotape, "The Choice," have been sent to 136 high school science teachers, administrators, and curriculum coordinators. The tape would be shown to junior and senior students, to encourage them to consider a career in the coatings industry. Members of the Society would be available to answer any questions.

The final project was embodied in a letter and flyer sent to 30 colleges and universities actively promoting the Federation's Alfred L. Hendry Award. The $1,000 cash prize, awarded at the Annual Meeting and sponsored by a grant from the Southern Society for Coatings Technology, is presented to the best paper on some aspect of coatings technology authored by an undergraduate student currently enrolled in a college program.

North Dakota State University Announces Summer '89 Short Course Program Schedule

The Polymers and Coatings Department of North Dakota State University (NDSU), Fargo, ND, has announced its summer coatings short course schedule.

The schedule of classes is as follows: "High Solids Coatings"—June 5-9; "Coatings Science"—June 12-23; and "Radiation Curable Coatings"—August 9-11.

The courses on "High Solids" and "Radiation Curable Coatings" are designed for experienced research or development personnel in these fields. Featured will be recent developments and selected topics will be covered in depth. The classes will emphasize the underlying physical, organic, and polymer chemistry. Theoretical considerations will be related to practical problems, and new approaches will be suggested.

"High Solids Coatings" topics to be featured include: viscosity; resins; crosslinking and film properties; application properties; surface spectroscopy; and recent and current research. Instructors will be Loren Hill, Frank Jones, Peter Pappas, and Marek Urban.

The two-week "Coatings Science" class is designed for chemists relatively new to the field and for more experienced chemists who seek broader perspective and understanding. Participants should have had at least two years of college chemistry.

"Coatings Science" is structured to provide an understanding of the principles that underlie coatings technology. Approaches to improving coatings performance within cost, safety environmental, and energy conservation constraints will be emphasized. Subjects areas of study are: film formation; resins; acrylic resins, chain-growth polymerization; amine-formaldehyde resins, crosslinking; step-growth polymerization, polyester and alkyd resins; epoxy resins; urethane coatings; solvents; rheology; appearance of coatings; pigments and pigment dispersion; coatings performance; current research topics; and coatings formulation. Course instructors will be: F. Louis Floyd, Loren Hill, Frank Jones, Peter Pappas, Clifford Schoff, Marek Urban, and Zeno Wicks.

The course "Radiation Curable Coatings" will focus on: materials for UV and EB curing; formulations and properties; curing; and applications. Frank Jones and Peter Pappas will serve as instructors.

For additional information concerning program content, contact Frank N. Jones, NDSU, Polymers and Coatings Department, Fargo, ND 58105-5819.

Pacific Northwest Society to Host 42nd Annual Symposium, May 4-6

The 42nd Annual Spring Symposium of the Pacific Northwest Society will be held on May 4-6 at the Marriott, Portland, OR. Among the presentations scheduled are:

"A Second Generation Modifier for Low VOC Polyurethane and Melamine Coatings"—Cheryl Nelson Blomquist, of CasChem, Inc.

"Calculation Approach to Efficient TiO_2 Formulation in Coatings"—Rebecca Craft, of Du Pont

"Novel Non-Metallic Drier for Oleoresinous Coatings"—Dennis Dalton, of Cosan Chemical Corp.

"Water-Borne Resins—Versatility and Compliance"—Carol Williams, of NL Industries

"Statistical Process Control"—Heinz Neumann, of Rohm and Haas

"Zirconium Silica Hydrogel—A Unique Functional Pigment"—Dominick De Santis, of the Silica Products Group of MMII, Inc.

"Titanium Dioxide's Contribution to the Durability of Paint Films"—Juergen Braun, of Du Pont

"High Performance Polyurethane Coatings Systems for the Furniture and Kitchen Cabinet Industry"—Bernd Riberi, of Mobay Corp.

For additional details, contact Steve Reardon, Program Chairman, Imperial Paint Co., 2526 N.W. Yeon Ave., Portland, OR 97210.

Philadelphia Society Technical Committee To Conduct Titanium Dioxide Seminar

The Technical Committee of the Philadelphia Society for Coatings Technology is sponsoring the seminar "Understanding and Dealing with the TiO_2 Shortage." The symposium will take place at the Philadelphia Airport Hilton Inn on May 1.

The seminar will feature presentations in the area of market trends and current TiO_2 extender technology. Subjects to be featured include:

"TiO_2 Supply and Demand"—Arthur P. Wollenweber, of E.I. du Pont de Nemours & Co.;

"Flooding and Floating in Pigment Mixtures Containing Titanium Dioxide"—Edward Orr, of Byk-Chemie USA;

"Effective TiO_2 Utilization"—Beth Whitney, of E.I. du Pont de Nemours & Co.;

"Efficient Formulating Techniques"—Daniel O. Adrien, of Burgess Pigment Co.;

"Saving TiO_2 By Using Opaque Polymer"—Alexander J. DiTucci, of Rohm and Haas Co.; and

"Meeting the Challenge of Today's TiO_2 Situation with Effective TiO_2 Extenders"—Greg Allie, Frank Molesky, and Thad Broome, of J.M. Huber Corp./Solem Industries.

A panel discussion will follow the close of the last presentation.

For further seminar information, contact Program Chairman Thomas L. Peta, C.J. Osborn, Division of Suvar Corp., P.O. Box 1310, Merchantville, NJ 08109.

NACE Annual Conference Scheduled for April 17-21

Corrosion/89, the annual international conference sponsored by the National Association of Corrosion Engineers (NACE), will be conducted April 17-21, in New Orleans, LA. The conference runs concurrently with the Materials Performance and Corrosion Show where more than 350 exhibitors will display a comprehensive line of products and services.

The NACE program will feature more than 500 papers presented by international corrosion experts and the symposia will pertain to corrosion prevention and control.

For more details on Corrosion/89, contact NACE Conference Manager, P.O. Box 218340, Houston, TX 77218.

16th Annual Water-Borne Symposium Boasts Record-Breaking Attendance

The 16th Annual Water-Borne and Higher Solids Symposium, held on February 1-3, in New Orleans, LA, welcomed a record-setting attendance of nearly 500 participants from industry and academia. The 2-½ day symposium, jointly sponsored by the Department of Polymer Science at the University of Southern Mississippi and the Southern Society for Coatings Technology, enabled attendees to explore the chemistry, formulation, and new developments in water-borne and higher solids coatings.

A Plenary Lecture by James O. Stoffer, of the University of Missouri-Rolla, entitled "The Chemistry of the Silane Coupling Agent in Coatings," introduced the technical presentations which included:

"Silicones in High Solids and Water-Borne Coatings: The Influence of Chemical Structure Upon Properties"—E.W. Orr, of Byk-Chemie

"Thermal and Mechancial Properties of Reactive Coatings: Property Development as a Function of Cure"—W.P. Yang and L.C. DeBolt, of Sherwin-Williams Co.

"Compliant Coatings for Aerospace Applications"—D.F. Pulley, of Naval Air Development Center

"Compliant Coatings for the Aircraft Industry"—J.W. Gooch, of Georgia Tech Research Institute

"Recent Studies of the Curing of Polyester-Melamine Enamels, Possible Causes of Overbake Softening"—F.N. Jones, S. Gan, and R.D. Solimeno, of North Dakota State University, and L.W. Hill, of Monsanto Polymer Products Co.

"A New General Purpose Coalescing Aid for Latex Paint"—W.D. Arendt, of Velsicol Chemical Corp.

"Effects of Particle Size Distribution in Latex Paint"—A. Rudin, of University of Waterloo

"New Latexes with Moisture Vapor Barrier Alkali Resistance and Tannin Properties"—V.L. Stevens, of Dow Chemical Co.

"Long-Term Stability of Cellulose-Ester Coatings"—N.S. Allen, M. Edge, and T.S. Jewitt, of Manchester Museum, Manchester University

"An Overview of Electron Beam Chemistry and Applications for Radiation Curing of Fluorinated Acrylates, Poly(Vinyl Alcohol); and Poly(Vinyl Butyral)"—J. Pacansky and R.J. Waltman, of IBM Almaden Research Center

"Approaches to Water-Based Radiation Curable Coatings"—F.J. Kosnik, of Interez, Inc.

"Novel Metal Oxide/Polymer Microcomposite Films and Coatings Via Sol/Gel Chemistry"—K.A. Mauritz, C.K. Jones, and R.M. Warren, of University of Southern Mississippi

"An Interior Two-Coat System for Metal Food Closures"—P.J. Palackdharry and L. Seibel, of Midland Div./The Dexter Corp.

"Water-Borne Automotive Topcoats"—R. Laible and D.V. Beelen, of Akzo Coatings GmbH

"Water-Borne Corrosion Protective Coatings for Steel and Concrete Based on Polymers Crosslinking with Active and Reactive Pigments"—W. Tippi

"Water-Borne Coating Systems for Drawn Wall-Ironed (DWI) Food Containers"—P.J. Palackdharry and M.J. Flament-Garcia, of Midland Div./The Dexter Corp.

"Coupling Solvent Effects on Water-Reducible Alkyd Resins"—R.G. Vance, N.H. Morris, and C.M. Olson, of Dow Chemical U.S.A.

"Investigations About the Mechanism of Pigment Stabilization in Water Dilutable Paint Systems"—M. Cremer, of Sachtleben

"Polyurethanes as Reactive Co-Solvent in Water-Borne Coatings"—W.J. Blank, of King Industries, Inc.

"Properties of Coatings Derived from an Unfilled and Filled Ionic Polyurethane"—C.L. Beatty, of University of Florida

"Carboxyl Modified Polyols in Water-Borne Urethane Applications"—R.C. Hire, of Olin Corp.

"Solvent and Catalyst Effects in the Reaction of Aliphatic Isocyanates with Alcohols and Water"—S.D. Seneker and T. Potter, of Mobay Corp.

"Novel One-Component Urethane Coatings"—B. Taub and G. Petschke, of NL Chemicals

"Zirconium Silica Hydrogel—A Unique, New Compound"—D.A. De Santis, of Silica Products Group

"A Comparison of Methods for the Preparation of Acetoacetylated Coating Resins"—J.S. Witzeman, W.D. Nottingham, and F.D. Rector, of Eastman Chemicals Div., Eastman Kodak Co.

"Swelling and Solubility Studies in Methacrylate Interpenetrating Polymer Networks"—J.C. Graham, P.K. Kukkala, and S. Shyu, of Eastern Michigan University

"Going Against Tradition: A New Family of Epoxy Resins Which Are Weatherable, and Reactive at Ambient Temperatures"—M. Agostinho, of CIBA-GEIGY Corp.

"High Solids Coatings Compositions Containing Polymer-Bound Light Stabilizer Acrylic Resins"—P.A. Callais, V.R. Kamath, and J.D. Sargent, of Lucidol Div./Pennwalt Corp.

"Chemistry and Coatings Applications of MAGME Crosslinkable Monomer"—R.G. Lees, N.J. Albrecht, G.A. Gelineau, W. Jacobs, F.M. Lee, and H.R. Lucas, of American Cyanamid Co.

"Choosing the Most Effective Dispersants for High Solid Coatings Systems"—J.W. Joudrey and M. Schnall, of Troy Chemical Corp.

"Thermal Sag Control in High Solids Baking Enamels"—A. Smith, W.W. Reichert, and H. Nae, of NL Chemicals

"The Chemistry of Aluminum Organic Crosslinkers for High Solid Alkyds"—D.J. Love, of Manchem

"Developmental Studies of the Effects of Filler/Additives on Formulated Elastomeric Adhesive—Sealants"—S.S. Sandhu, of University of Dayton.

At the conclusion of the symposium, the Elias Singer Best Paper Award, sponsored by Troy Chemical Co., was presented to S. Witzeman, W.D. Nottingham, and F.D. Rector, of Eastman.

Proceedings of the symposium will be used by the Department of Polymer Science, University of Southern Mississippi, for student scholarships and program development.

ASTM Seeks Comments On "Cure Determination"

ASTM Sub-committee D01.53 on Coil Coated Metal is seeking comments, suggestions, and recommendations on the subject of "cure determination." Sub-committee Chairman Richard J. Tucker, of Kirby Building Systems, Inc., indicates that current "cure tests," such as "Pencil Hardness" and "Solvent Resistance" are frequently challenged regarding both their meaning and validity, often as a result of the difficulty in achieving precision, accuracy, and reproducibility. Chairman Tucker is consequently seeking comment to guide ASTM Sub-committee D01.53 in addressing either more meaningful types of testing or in upgrading the current test procedures for greater reliability, if needed. All interested parties are encouraged to either call or send written commentary to:

George R. Pilcher
Hanna Chemical Coatings Corp.
P.O. Box 147
Columbus, Ohio 43216-0147
(614) 294-3361

All responses will be kept confidential.

Papers Needed for ASTM Corrosion Symposium; Workshops Slated for Chicago and Philadelphia

Papers are needed for the Silver Anniversary Symposium on "Corrosion Testing and Evaluation" to be held in Orlando, FL, on November 6-7. The symposium is sponsored by the American Society for Testing Materials (ASTM), Philadelphia, PA, standards-writing Committee G-1 on Corrosion of Metals and marks the 25th anniversary of the formation of G-1.

Original papers are invited on topics of corrosion testing and methods of evaluating results in soils, atmospheres, immersion, and other specific environments. Authors should submit a title, a 300-500 word abstract, and an ASTM Paper Submittal Form by May 1 to Dorothy Savini, Symposia Coordination, ASTM, 1916 Race St., Philadelphia, PA 19103.

A Special Technical Publication (STP) based on the symposium proceedings is anticipated by ASTM. Final manuscripts for the STP based on this symposium are due by September 1. More details are available from Symposium Chairman Robert Baboian, Texas Instruments, Inc., Electrochemical and Corrosion Laboratory, Mail Station 10-13, Attleboro, MA 02703, or Sheldon W. Dean, Jr., Air Products and Chemicals, Inc., P.O. Box 538, Allentown, PA 18105.

In other news, a pair of two-day workshops on Paint Volatile Organic Compounds (VOC) will be presented by ASTM Standards Technology Training. The workshops will be held at the DeSoto, Inc. Research Center, in Chicago, IL, on May 3-4, and at the Du Pont Marshall Laboratory, in Philadelphia, PA, on November 1-2.

The workshops will include laboratory demonstrations of gas chromatography, the Karl Fischer method, and others. The basic principles of the ASTM test methods used to measure VOC under Reference Method 24 in the U.S. Environmental Protection Agency (EPA) New Source Performance Standard will be covered. The workshop is designed for chemists and others who use U.S. EPA tests to determine if paints or coatings meet VOC requirements.

The registration deadline is one week before the workshop starting date. For more information, write Kathy Dickinson, ASTM Standards Technology Training, 1916 Race St., Philadelphia, PA 19103.

Five Quality Management Seminars Scheduled by Du Pont Company

Management Quality Services of the Du Pont Co., Wilmington, DE, has announced the 1989 schedule for the five seminars in the Product Quality Management Series. The seminars are designed for personnel involved in research and development.

The two and one-half day class "Strategy of Experimentation" will teach an operational approach to statistical experimental design. The seminar will cover strategies for scouting, quantifying interactions, and optimizing product and process design.

"Strategy of Formulations Development" will feature the latest technology for planning, analyzing, and interpreting experiments involving mixtures of ingredients. Each session runs for two and one-half days.

"Quality Technology for Managers," a one and one-half day class, will provide an understanding of statistical quality control methods used in business and government and will enable attendees to choose the best methods for meeting quality and productivity improvement objectives.

The computer-intensive course, "Experimental Design for Quality Improvement," will instruct on how to meet key product quality goals. The two-day seminar will teach how to improve product design and product and process control skills by using experimental design and analysis software.

The fifth seminar is "Experimental Design Overview." The one-half day, on-site seminar will cover the principles, methods, and business importance of experimental design.

For information on dates and locations of the five seminars, contact James Brock, Du Pont Quality Management Services, Montgomery Bldg., Room 235-C, P.O. Box 80800, Wilmington, DE 19880-0800.

CALL FOR PAPERS

International Symposium on Surface Phenomena and Fine Particles In Water-Based Coating and Printing Technology
August 22-26 Boston, MA

The International Symposium, "Surface Phenomena and Fine Particles in Water-Based Coating and Printing Technology," will be held at the Marriott Copley Place, Boston, MA, on August 22-26. The symposium is being sponsored by the Fine Particle Society.

Papers from all areas of surface and colloid chemistry of fine particles related to coating and printing formulations are being solicited. The following and related topics will be considered: Characterization of materials employed in all types of coatings such as paint, pharmaceutical, photographic film, and agricultural coatings; Role of fine particles in coating and printing processes; Interactions between coating materials and substrates; Adhesion of coating on substrates; Surface characterization of coating and printing substrates; Stability of coating and printing dispersions in aqueous media; Coating and printing defects in relation to surface properties and fine particles; Problems associated with water-based coating and printing; Wettability of substrates; and Dynamic and equilibrium surface properties of chemicals used in coating and printing formulations.

Abstracts, not to exceed 200 words, are due May 1. Full manuscripts for review and inclusion in a proceedings book are due at the time of the meeting.

For more information, contact Mahendra K. Sharma, Research Laboratories, Eastman Kodak Co., P.O. Box 1972, Kingsport, TN 37662, or F.J. Micale, Sinclair Laboratory, Bldg. 7, Lehigh University, Bethlehem, PA 18015.

Spray Finishing Workshop Scheduled for May 8-12

The College of Technology of Bowling Green State University, Bowling Green, OH, and the DeVilbiss Co., Toledo, OH, are sponsoring a "Spray Finishing Technology Workshop," on May 8-12. The workshop sessions will be held at the DeVilbiss Technical Training Center, World Headquarters, in Toledo.

Each participant will have an opportunity for hands-on practice and will earn 3.5 Continuing Education Units.

For further details, contact Richard A. Kruppa, Professor of Manufacturing Technology, College of Technology, Bowling Green State University, Bowling Green, OH 43403-0301.

Resin Specification Guide

A six-page publication containing specifications and typical properties of more than 80 epoxy resins and related products, including liquid resins, solid resins, solutions, brominated resin solutions, specialty, multifunctional resins, and curing agents has been released. Information on special storage and handling precautions is also provided. To receive a copy of the "1988/89 Epoxy Resin Specification Guide," write to Manager, Resins Advertising, Shell Chemical Co., One Shell Plaza, P.O. Box 2463, Houston, TX 77252-2463.

Fluorochemical Intermediates

A booklet that describes a new fluorochemical intermediate is now available. The booklet details properties and potential applications, and includes a chart of structures and information about how the intermediates can be used in various reactions. Copies of "Zonyl" fluorochemical intermediates booklet can be obtained by writing to: Du Pont Co., Room B-16217, Wilmington, DE 19898 and requesting publication H-00172.

Recovery Distillation

Literature has been released which describes the properties of a solvent recovery distillation system which is microprocessor controlled. For more information, contact CB Mills (Div. of Chicago Boiler Co.), 1225 Busch Parkway, Buffalo Grove, IL 60089.

Protective Coatings

Four new technical data sheets describe the properties of protective coatings designed to protect and enhance the performance of engineered plastics. Data Sheet 901 provides information on a coating developed primarily for interior use on acrylic (polymethylmethacrylate) substrates. Data Sheets 911 and 912 provide test results covering environmental exposure, scratch/abrasion testing, and chemical resistance of the coatings. A product designed as an anti-fogging treatment for polycarbonates is the subject of Data Sheet 931. For additional details, contact Robert Milano, Product Manager, Panelgraphic Corp., 10 Henderson Dr., West Cardwell, NJ 07006.

Wastewater Treatment

A new 12-page full-color brochure highlights a company's water and wastewater treatment capabilities. Included in the brochure is a flow chart showing a sample configuration of a water treatment process, as well as illustrations of biological waste treatment capabilities, such as aeration, neutralization, sludge mixing, and equalization. For complete details, contact Betty Felix, Mixing Equipment Co., 135 Mt. Read Blvd., Rochester, NY 14603.

Roof Coatings

A new technical bulletin describes the performance properties of a company's terpolymer of vinyl acetate-ethylene-vinyl chloride, for white reflective roof coating applications. Extensive test data and formulation recommendations are included. To obtain a copy of the bulletin highlighting Airflex® 742-BP, contact Air Products and Chemicals, Inc., Polymer Chemicals Div., 7201 Hamilton Blvd., Allentown, PA 18195-1501.

OSHA Compliance Kit

The Occupational Safety and Health Administration (OSHA) has produced a Hazcom kit. This kit provides companies with instructions for compliance with the expanded Hazard Communication Standard. The kit is available for $18.00 from Labelmaster, Div. of American Labelmark Co., 5724 N. Pulaski Rd., Chicago, IL 60646.

Paint Mixer

A technical data sheet describes the features and capabilities of two new models in a line of paint mixers. For further details, contact Red Devil, Inc., 2400 Vauxhall Rd., Union, NJ 07083-1933.

Wood Conditioner

Information is now available which details a new wood conditioner. This clear, low-odor solution is designed for use as a pretreatment before applying interior stains or finishes on soft woods like pine or plywood. For further information, contact Akzo Coatings Inc., P.O. Box 7062, Troy, MI 48007-7062.

Antifloating Agent

A micro-milled calcium carbonate powder treated with surface active agents designed to improve pigment wetting and reduce interfacial tension in coating systems is highlighted in a technical bulletin. This nonionic, antifloating agent is intended for systems that use mixtures of fine particle size inorganic and organic pigments, such as tinting bases. For further information, contact the customer service department at Troy Chemical Corp., One Avenue L, Newark, NJ 07105.

Linings Inspection Standard

Steps required for inspecting a lining on steel and concrete are addressed in a new standard issued by the National Association of Corrosion Engineers (NACE). Developed by NACE Task Group T-6-2 on Inspection of Linings on Steel and Concrete, NACE Standard RP0288-88 includes specifications on procedures to be followed at pre-job conferences, the type of inspection equipment that should be used, surface preparation, and coating materials and application. NACE standards are available for purchase from the NACE Publications Order Dept., P.O. Box 218340, Houston, TX 77218.

Acrylic Gloss

A technical bulletin details the features of a direct-to-metal acrylic gloss coating. This high-gloss, water-reducible acrylic coating is designed for direct application on steel, galvanizing, iron, aluminum, and concrete without a primer. Recommended applications include interior and exterior applications such as bridges, storage tanks, foundries, piping, and equipment. For further information on DTM Acrylic Gloss Coating, write to: Sherwin-Williams Stores Group, c/o Robert Silverman Co., 1375 Euclid Ave., Cleveland, OH 44115.

Electronic Labeling

Information has been released which describes an electronic label printing system featuring interactive software that allows the creation of label designs on-screen. A free demo disk of the Performance Series software is available by contacting Mark Bjerkestrand, Labeling Systems Products Manager, Diagraph Corp., 3401 Rider Trail South, St. Louis/Earth City, MO 63045.

Viscosity Directory

An expanded directory of contemporary rheological literature is now being offered. The directory, which includes over 80 titles, lists 11 categories, including such headings as: foods, paints and coatings, biological fluids, thick film inks, etc. The directory is available, free of charge, from Brookfield Engineering Laboratories, Inc., Dept. NR-66, 240 Cushing St., Stoughton, MA 02072. Request Directory #091-C, "Technical Papers on Viscosity Measurement and Control."

Acrylic Resins

A new 12-page brochure on a line of acrylic resins has been published. The brochure covers both solution grade and solid grade acrylic resins for solvent-borne industrial finishes. The brochure provides comprehensive listings for more than 50 resins available for formulating industrial finishes. Copies of Acryloid Acrylic Resins for Industrial Finishing, brochure 82A4, are available from Rohm and Haas Co., Marketing Services, Independence Mall West, Philadelphia, PA 19105.

Safety Training

A brochure which describes a revised and expanded Safety Training Observation Program for Employees in now available. The program is designed to train employees to recognize and eliminate unsafe acts and prevent injuries, as well as to increase their safety awareness and develop positive safety attitudes. Direct inquiries on this brochure and the program to: STOP for Employees, Du Pont Safety Services, P.O. Box 80800, Wilmington, DE 19880-0800.

Superabsorbent Polymers

A four-page brochure provides information on superabsorbent polymers. These superabsorbents are solid, water-swellable, crosslinked, polymeric salts designed to absorb water or aqueous solutions. The brochure describes the polymers' characteristics, such as capacity, gel strength, soluble extractables, toxicity, and speed of absorption. For more information, or a copy of Bulletin 150, contact Nalco Chemical Co., Marketing Communications, One Nalco Center, Naperville, IL 60566-1024.

Precipitated Silica

A new precipitated silica pigment designed to be used as a coating pigment where surface smoothness is critical is the focus of a technical data sheet. The pigment can be incorporated for size press applications requiring improved brightness and surface smoothness. The precipitated silica product is very pure, with no calcium silicate or mineral impurity residue which could give color to or lower the brightness of finished paper. For further information on San Sil™ KU 33 pigment, write to Specialty Chemicals, PPG Industries, One PPG Place, Pittsburgh, PA 15272.

Quality Improvement

A four-color brochure describes a company's quality improvement (QI) process. According to the brochure, QI pinpoints problem areas and answers important questions through statistics which are charted, plotted, and graphed to measure consistency and accuracy. The basic charting techniques simplify problem identification, analysis, and determination of appropriate action. For more information, and a copy of brochure GP10-1020, write: Lord Corporation, Chemical Products Group, 2000 West Grandview Blvd., P.O. Box 10038, Erie, PA 16514.

Emulsifiers

A series of systems which emulsify resins as a means of reducing the volatile components found in coatings, adhesives, and inks, is the subject of technical literature. Resins across a variety of systems have been evaluated, including polyester, epoxy, urethane, hydrocarbon, chloroparaffin, and alkyd. For additional information, write to Philip Reitano, ICI Specialty Chemicals, ICI Americas Inc., Wilmington, DE 19897.

Solvent for Cured Silicones

Information has been released which details a nonhazardous solvent designed to dissolve cured polymer in silicone elastomers and resins. The product has little effect on other rubbers and plastics and can be used to remove silicones from mixed materials without damaging other polymers or paints. Inquiries may be directed to Mr. A. Fisher, C&M Research Ltd., Royal Works, Bilton Way, Enfield, Middlesex EN3 7LW England.

Printing Ink Resin

Information has been released which describes a new resin used as a binder in water-borne flexographic newspaper inks. Product literature and samples of this new styrene acrylic are available by contacting The BFGoodrich Co., Specialty Polymers and Chemicals Div., Carboset Marketing Dept., 6100 Oak Tree Blvd., Cleveland, OH 44140.

Filling Machines

A liquid and semi-liquid packaging machine which adapts to filling containers in both five-gallon and 16-gallon sizes is described in a technical data sheet. Additional information on this high speed volumetric machine may be obtained by writing: Ambrose Co., 2649 151st Place N.E., Redmond, WA 98052.

Deposit Inhibitor

Literature has introduced a line of deposit inhibitors designed to protect boiler system components. This program provides dosage flexibility and is less sensitive to under- and overfeed conditions. For more details on the ADVANTAGE® deposit inhibitors line, write to John R. Stinger, Manager, Marketing Communications, Drew Industrial Div., One Drew Plaza, Boonton, NJ 07005.

Mildewcide

A mildewcide designed to protect dried paint films from the defacing effects of a broad spectrum of fungi is the subject of a new brochure. The brochure documents performance properties through the use of photos from exposure tests conducted over 13 and 18 months in the severely mildew-prone Florida climate. Copies of SKANE M-8 Mildewcide for Latex and Solvent-Based Coatings, brochure #81A104, may be obtained from Rohm and Haas Co., Marketing Services, Independence Mall West, Philadelphia, PA 19105.

Epoxy Primer

A chemically-cured, water reducible epoxy primer is the subject of a technical bulletin. Designed to provide corrosion resistance and chemical resistance over aluminum substrates, this primer can be sprayed via standard suction or pressure spray equipment. Additional details may be obtained from: Crown Metro Aerospace Coatings, 450 East Park Ave., Greenville, SC 29601.

Solids Analyzer

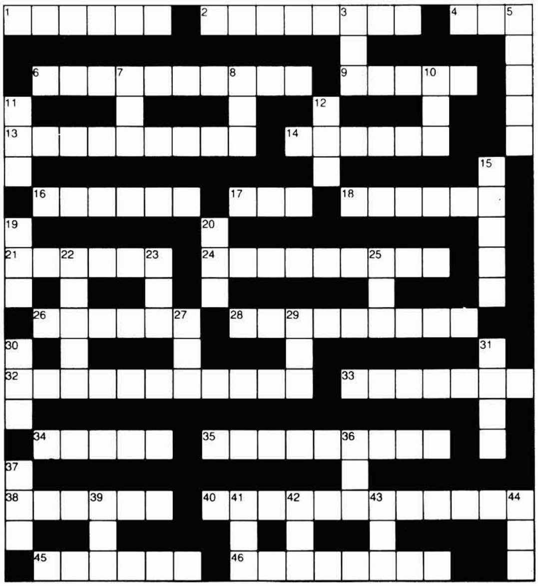
An analyzer which provides a method for checking solids concentration of combustible black liquor in order to fine-tune operations before and after recovery boilers has been introduced in literature. The analyzer utilizes microwave energy to rapidly dry the sample, a built-in balance to weigh the sample and microprocessor computer to perform calculations simultaneously. For more information, contact Vickie Serrett, CEM Corp., P.O. Box 200, Matthews, NC 28106.

Plastic Barrier Containers

A line of plastic barrier containers that reduces permeation for many hydrocarbon-based solvents is discussed in literature. The containers are available in five F-style container sizes ranging from one pint to two and one-half gallons, and round containers in both one quart and one gallon capacities. For a copy of the Airopak® data sheet, write Air Products and Chemicals, Inc., Surface Treated Products, P.O. Box 538, Allentown, PA 18195.

CrossLinks

by Earl Hill



Solution to be Published in May issue

No. 29

ACROSS

1. Unsaturated open-chain hydrocarbon (Chem.)
2. Natural potassium aluminum silicate
4. Material used in a printing press
6. Used to determine viscosity
9. Method of applying paint
13. Type of viscosity measured by 6 Across, K____
14. The eave of a building
16. Thin protective/ ornamental covering
17. Aqueous vapor transmission (Abr.)
18. Organic red pigment, R____
21. Pasty material used as a caulk or as an adhesive
24. Mineral identical in composition to 2 Across, N____
26. To cover with a first coat of plaster
28. Form of calcium oxide
32. The reciprocal of resistance (Elect.)
33. Viscosity reducer
34. Decorative covering used on walls
35. Device element used in electrocoating
38. Indirect form of printing
40. Composed of diatoms
45. Sward ____
46. Metal used in pigment manufacture of e.g., Green Cinnabar

DOWN

3. Chlorinated diphenyl, ecologically bad
5. A unit of industrial production
7. A machine part used to translate motion
8. Method of measuring a flash point (Abr.)
10. ____ to touch, dry time criterion
11. A pseudonym
12. Salt____; testing chamber
15. Dark brown, referring to pigments
19. 2-amino-2-methyl-1-propanol (Abr.)
20. ____ Point (in distillation)
22. Luster
23. Illumination Commission
25. Frequent excuse for not being at work
27. Decomposition in wood by fungi
29. Handy in drinks at Christmas party
30. Chromatic value (Abr.)
31. Beeswax (Syn.)
36. The edge of a paint can
37. Fugitive organic component of a paint (Abr.)
39. Slang for second
41. Interoffice communication (Abr.)
42. Bituminous residue
43. American institute concerned with petroleum products (Abr.)
44. Styrene maleic anhydride (Abr.)

Coming Events

FEDERATION MEETINGS

For information on FSCT meetings, contact FSCT, 1315 Walnut St., Philadelphia, PA 19107 (215-545-1506).

1989

(May 16-19)—Federation "Spring Week." Seminar on the 16th and 17th; FSCT Incoming Society Officers Meeting on the 18th; FSCT Board of Directors Meeting on the 19th. Los Angeles Airport Marriott, Los Angeles, CA.

(Nov. 8-10)—67th Annual Meeting and 54th Paint Industries' Show. New Orleans Hilton and The Rivergate, New Orleans, LA.

1990

(Oct. 29-31)—68th Annual Meeting and 55th Paint Industries' Show. Convention Center, Washington, D.C.

1991

(Nov. 4-6)—69th Annual Meeting and 56th Paint Industries' Show. Convention Center, Toronto, Ontario, Canada.

SPECIAL SOCIETY MEETINGS

1989

(Apr. 19)—14th Annual FOCUS Conference of Detroit Society. Management Education Center, Troy, MI. (Detroit Society, 26727 Newport, Warren, MI 48089).

(May 1)—"Understanding and Dealing with the TiO_2 Shortage" Seminar sponsored by the Philadelphia Society. Philadelphia Airport Hilton Inn, Philadelphia, PA. (Thomas L. Peta, C.J. Osborn Chemical Co., Division of Suvar Corp., P.O. Box 1310, Merchantville, NJ 08109).

(May 4-6)—Pacific Northwest Society. Annual Symposium. Portland Marriott, Portland, OR. (John Daller, McCloskey Corp., 4155 N.W. Yeon, Portland, OR 97210).

(June 2-3)—Joint meeting of St. Louis and Kansas City Societies. Holiday Inn, Lake of-the-Ozarks, MO. (Howard Jerome, Mozel Equipment Co., 4003 Park Ave., St. Louis, MO 63110).

(June 6-7)—32nd Annual Conference on "Advances in Coatings Technology." Sponsored by the Cleveland Society for Coatings Technology. B.P. America Inc. Research and Development Center, Warrensville Heights, OH. (De Villa Moncrief, Sherwin-Williams Co., 601 Canal Rd., Cleveland, OH 44113).

1990

(Mar. 14-16)—Southwestern Paint Convention. Houston and Dallas Societies. Doubletree at Post Oak, Houston, TX. (Neil McBride, P.O. Box 841156, Houston, TX 77284-1156).

(Apr. 4-7)—Southern Society. Annual Meeting. Sandestin Beach Hilton, Destin, FL. (James R. Salisbury, Union Carbide Corp., 2043 Steel Dr., Tucker, GA 30084).

1991

(Feb. 18-20)—Western Coatings Societies' 20th Biennial Symposium and Show. San Francisco Hilton, San Francisco, CA.

OTHER ORGANIZATIONS

1989

(Apr. 17-21)—Corrosion/'89 sponsored by the National Association of Corrosion Engineers. New Orleans, LA. (NACE, Conference Manager, P.O. Box 218340, Houston, TX 77218).

(Apr. 20)—Powder Coating Technical Seminar. Sponsored by The Powder Coating Institute. Sheraton—Villa Inn, Vancouver, B.C., Canada. (The Powder Coating Institute, 1800 Diagonal Rd., Suite 370, Alexandria, VA 22314).

(Apr. 22-29)—Spring Meeting of the Materials Research Society. Town and Country Hotel, San Diego, CA. (Materials Research Society, 9800 McKnight Rd., Suite 327, Pittsburgh, PA 15237).

(Apr. 23-26)—National Coil Coaters Association (NCCA) Annual Meeting. Marriott's Marco Island Resort, Marco Island, FL. (NCCA, 1900 Arch St., Philadelphia, PA 19103).

(Apr. 23-28)—"7th International Meeting on Radiation Processing." Noordwijkerhout, The Netherlands. (E. Franken, 7th International Meeting on Radiation Processing, P.O. Box 4240, 6710 EE Ede, The Netherlands).

(Apr. 24-26)—"Crosslinked Polymers: Chemistry, Properties, and Applications" Short Course sponsored by State University of New York at New Paltz. Hotel Thayer, West Point, NY. (Angelos V. Patsis, Chemistry Dept., State University of New York, New Paltz, NY 12561).

(Apr. 24-26)—"Chromatographic Separation of Enantiomers." Short Course sponsored by the University of Missouri-Rolla, Rolla, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, Rolla, MO 65401-0249).

(Apr. 24-26)—"Thermoplastic Elastomers." Short Course sponsored by State University of New York (SUNY). Hotel Thayer, West Point, NY. (A.V. Patsis, Chemistry Dept., SUNY, New Paltz, NY 12561).

(Apr. 24-27)—40th National Plant Engineering & Maintenance Show. McCormick Place East, Chicago, IL. (Show Manager, National Plant Engineering & Maintenance Show, 999 Summer St., Stamford, CT 06905).

(Apr. 24-27)—ASTM Committee D-33 Meeting. Dallas Hilton, Dallas, TX. (Anne McKlindon, ASTM, 1916 Race St., Philadelphia, PA 19103).

(Apr. 24-28)—"Applied Rheology for Industrial Chemists." Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Chemistry Dept., Kent State Univ., Kent, OH 44242).

(Apr. 24-29)—Materials Research Society Spring Meeting, Symposia, and Exhibition. San Diego, CA. (MRS, 9800 McKnight Rd., Ste. 327, Pittsburgh, PA 15237).

(Apr. 26)—"Aspects of Formulating Water-Borne Systems." 47th Annual Symposium of the Chemical Institute of Canada Protective Coatings Division. Hélène de Champlain Restaurant, Montreal, Que., Canada. Other date: April 27—The Old Mill, Toronto, Ont., Canada. (Bert G. Papenburg, Symposium Chairman, Canada Colors & Chemicals, 9999 Trans-Canada Highway, St. Laurent, Que., Canada).

(May 1-4)—Society of Manufacturing Engineers' International Conference. Cobo Hall, Detroit, MI. (Violet Greco, SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930).

(May 2-4)—PaintCon '89. Sponsored by *Industrial Finishing* magazine. O'Hare Expo Center, Rosemont, IL. (PaintCon '89, 2400 E. Devon Ave., Suite 205, Des Plaines, IL 60018).

(May 2-4)—"Getting into Compliance with Environmental Regulations for Paints and Coatings Facilities." Course sponsored by the University of California at Berkeley, Berkeley, CA. (Continuing Education in Engineering, UC Berkeley Extension, 2223 Fulton St., Berkeley, CA 94720).

(May 2-5)—1st International Paint Congress. Sponsored by the Brazilian Association of Paint Manufacturers-ABRAFATI and the Union of the Paints and Varnishes Industry of the State of São Paulo. São Paulo, Brazil. (Guazzelli Congressos, Rua Manoel da Nóbrega, 864, 04001—São Paulo, Brasil).

(May 3-4)—"Paint Volatile Organic Compounds (VOC)" Workshop sponsored by ASTM Standards Technology Training. DeSoto, Inc. Research Center, Chicago, IL. (Kathy Dickinson, ASTM Standards Technology Training, 1916 Race St., Philadelphia, PA 19103).

(May 3-7)—80th Annual Meeting & Exposition of the American Oil Chemists' Society. Cincinnati Convention Center, Cincinnati, OH. (Myra Barenberg, AOCS Book Exhibit, 1608 Broadmoor Dr., P.O. Box 3489, Champaign, IL 61821-0489).

(May 8-10)—"Ceramic Matrix Composites" Seminar sponsored by University of Wisconsin—Milwaukee. Milwaukee, WI. (Richard G. Albers, Program Director, Center for Continuing Engineering Education, UW-Milwaukee, 929 N. Sixth St., Milwaukee, WI 53203).

(May 8-12)—"Spray Finishing Technology Workshop" sponsored by Bowling Green State University and the DeVilbiss Co. DeVilbiss Co. Technical Training Center, Toledo, OH. (Judy Jennings, College of Technology, Bowling Green State University, Bowling Green, OH 43403).

(May 8-12)—"Dispersion of Pigments and Resins in Fluid Media." Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Chemistry Dept., Kent State Univ., Kent, OH 44242).

(May 9-11)—"Process Safety Management" Seminar sponsored by DuPont Co. New Orleans, LA. Other dates and locations: July 11-13—Calgary, Alberta, Canada; Aug. 8-10—Wilmington, DE; Oct. 17-19—Philadelphia, PA; and Oct. 31-Nov. 2—San Antonio, TX. (Process Safety Management, DuPont Safety Services, P.O. Box 4500, Greenville, DE 19807).

(May 15-17)—Eighth Annual Meeting of the Powder Coatings Institute. Marriott's Marco Island Resort, Marco Island, FL. (The Powder Coating Institute, 1800 Diagonal Rd., Suite 370, Alexandria, VA 22314).

(May 15-18)—14th Annual Powder & Bulk Solids Conference/Exhibition. O'Hare Exposition Center, Rosemont, IL. (Show Manager, Powder & Bulk Solids Conference/Exhibition, 1350 E. Touhy Ave., P.O. Box 5060, Des Plaines, IL 60017-5060).

(May 15-19)—"Physical Testing of Paints and Coatings." Short Course sponsored by the University of Missouri-Rolla, Rolla, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, Rolla, MO 65401-0249).

(May 15-20)—"Interpretation of IR and Raman Spectroscopy." Course sponsored by Vanderbilt University, Nashville, TN. (Clara Craver, Director, Fisk Infrared Institute, Box 15, Fisk University, Nashville, TN 37203).

(May 22-26)—"Adhesion Principles and Practice for Coatings and Polymer Scientists." Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Chemistry Dept., Kent State Univ., Kent, OH 44242).

(May 23-26)—ASTM Committee B-8 Meeting. Hyatt Regency Kansas City, Kansas City, MO. (Peggy Loughran, ASTM, 1916 Race St., Philadelphia, PA 19103).

(May 24-25)—"Accelerated Versus Natural Weathering" Symposium sponsored by the TNO Paint Research Institute. World Trade Center, Amsterdam, The Netherlands. (F.H. de la Court or T. Doorgeest, TNO Paint Research Institute, P.O. Box 203, 2600 AE, The Netherlands).

(May 24-26)—11th International Conference on "Advances in the Stabilization and Controlled Degradation of Polymers." Luzern, Switzerland. (Angelos V. Patsis, Institute in Materials Science, CSB 209, State University of New York, New Paltz 12561).

(May 29-31)—3rd International Conference on "Crosslinked Polymers." Luzern, Switzerland. (Angelos V. Patsis, Institute in Materials Science, State University of New York, New Paltz, NY 12561).

(June 5-9)—"High Solids Coatings." Short Course sponsored by North Dakota State University, Fargo, ND. (Frank N. Jones, NDSU, Fargo, ND 58105).

(June 5-9)—"Advances in Emulsion Polymerization and Latex Technology." 20th Annual Short Course sponsored by Lehigh University, Bethlehem, PA. (Mohamed S. El-Aasser, Emulsion Polymers Institute, Mountaintop Campus, Bldg. A, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

(June 11-14)—Dry Color Manufacturers' Assoc. Annual Meeting. The Greenbrier, White Sulphur Springs, WV. (Tracy Kruisselbrink, DCMA, Ste. 202, 206 N. Washington St., P.O. Box 20839, Alexandria, VA 22314).

(June 12-23)—"Coatings Science." Short Course sponsored by North Dakota State University, Fargo, ND. (Frank N. Jones, NDSU, Fargo, ND 58105).

(June 13-15)—Seventh Annual Hazardous Materials Management International Conference and Exhibition. Atlantic City Convention Center, Atlantic City, NJ. (John J. Frett, Show Manager, Tower Conference Management Co., 800 Roosevelt Rd., Bldg. E-Suite 408, Glen Ellyn, IL 60137-5835).

(June 18-21)—63rd Colloid and Surface Science Symposium. Sponsored by American Chemical Society Division of Colloid and Surface Science. University of Washington, Seattle, WA. (John C. Berg, Symposium Chairman, University of Washington, Dept. of Chemical Engineering, BF-10, Seattle, WA 98195).

(June 19-23)—"Corrosion Control by Coatings." Short Course sponsored by Lehigh University, Bethlehem, PA. (Henry Leidheiser, Jr., Zettlemoyer Center for Surface Studies, Sinclair Lab #7, Lehigh University, Bethlehem, PA 18015).

(June 21-23)—Oil and Colour Chemists' Association Biennial Conference. Grosvenor Hotel, Chester, England. (Mr. Christopher Lacey-Day, Director, OCCA, Priory House, 967 Harrow Rd., Wembly, Middlesex HA0 2SF, England).

(June 28-30)—"Chemically Modified Oxide Surfaces" Symposium. Holiday Inn, Midland, MI. (W.T. Collins, Mail Stop C41C00, Dow Corning Corp., Midland, MI 48686-0994).

(July 10-14)—15th International Conference on "Organic Coatings Science and Technology." Athens, Greece. (Angelos V. Patsis, Institute in Materials Science, CSB 209, State University of New York, New Paltz 12561).

(July 27-29)—27th Annual Convention of the Oil and Colour Chemists' Association New Zealand. Rotorua, New Zealand. (Mike Rowlands, OCCANZ, P.O. Box 5192, Auckland, New Zealand).

(Aug. 3-6)—31st Annual Convention of the Oil and Colour Chemists' Association Australia. Fairmont Resort, Leura, New South Wales. (Peter Parsons, Tioxide Australia P/L, 2A/6 Tooronga Terrace, Beverly Hills, NSW, Australia 2209).

(Aug. 9-11)—"Radiation Curable Coatings." Short Course sponsored by North Dakota State University, Fargo, ND. (Frank N. Jones, NDSU, Fargo, ND 58105).

(Aug. 21-25)—12th Annual "Advances in Emulsion Polymerization and Latex Technology" Short Course. Schatzalp Berghotel, Davos, Switzerland. (Gary W. Poehlein, Graduate Office [Savant], Georgia Institute of Technology, Atlanta, GA 30332–0265).

(Aug. 22-26)—"Surface Phenomena and Fine Particles in Water-Based Coating and Printing Technology." International Symposium sponsored by the Fine Particle Society. Marriott Copley Place, Boston, MA. (Mahendra K. Sharma, Research Laboratories, Eastman Kodak Co., Box 1972, Kingsport, TN 37662, or F.J. Micale, Sinclair Laboratory, Bldg. 7, Lehigh University, Bethlehem, PA 18015).

(Sept. 11-15)—"Laboratory Corrosion Testing." Short Course sponsored by the Southwestern Ohio Section of NACE and NACE/Fontana Corrosion Center at Ohio State. Ohio State University, Columbus, OH. (John Beavers, 2704 Sawbury Blvd., Columbus, OH 43235, or Steve Corey, 1020 W. Park Ave., Kokomo, IN 46901).

(Sept. 23-28)—12th World Conferences on Non-Destructive Testing sponsored by the Dutch Non-Destructive Testing Society. RAI International Exhibition and Congress Center, Amsterdam, The Netherlands. (RAI International Exhibition and Congress Center, Europaplein, 1078 GZ, Amsterdam, The Netherlands).

(Sept. 25-27)—Third Annual Hazardous Materials Management Conference and Exhibition of Canada (HazMat/Canada '89). Harbour Castle Westin Conference Centre, Toronto, Ont., Canada. (Tower Conference Management Co., 800 Roosevelt Rd., Bldg. E—Suite 408, Glen Ellyn, IL 60137-5835).

(Sept. 25-30)—American Chemical Society. 196th National Meeting. Los Angeles, CA. (B.R. Hodson, ACS, 1155—16th St. NW, Washington, D.C. 20036).

(Sept. 26-27)—Finishing '89. Telford Exhibition Center, Telford, Shropshire, England. (Nigel Bean, Turret Group Plc, Turret House, 171 High St., Rickmansworth, Herts, WD3 1SN).

(Sept. 26-28)—"Inspection of Coatings and Linings for Immersion Service" Course sponsored by KTA-Tator, Inc., Pittsburgh, PA. (KTA-Tator, Inc., 115 Technology Dr., Pittsburgh, PA 15275).

(Sept. 27-29)—Liquitec Expo '89 (Carolyn Mesce, Liquitec Expo, P.O. Box 630, West Paterson, NJ 07424).

(Oct. 4-6)—National Coil Coaters Association (NCCA) Fall Meeting. Hyatt Regency at O'Hare Airport, Chicago, IL. (NCCA, 1900 Arch St., Philadelphia, PA 19103).

(Oct. 23-25)—"High-Coatings." 9th International Conference of the Paint Research Association. Sheraton Hotel, Frankfurt, West Germany. (Dip Dasgupta, Head of Information Dept., PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD, England).

Advertisers Index

NOTE: The Advertisers' Index is published for the convenience of our readers and as an additional service to our advertisers. The publisher assumes no liability for errors or omissions.

'Humbug' from Hillman

Humbug's resident (in Atlanta) archivist, Roy Tasse, has come up with a dog-eared and yellowed 15-year-old copy of *The Farmers' Almanac.* It should keep our readers busy for a few columns to come. Thanks to Roy's collections and research, we will be rewarded with such gems as:

There was a fat man from Lahore
The same shape behind as before.
They did not know where
To offer a chair,
So he had to sit on the floor.

There will be other such tasty snacks for our patient readers to nibble on. So—feed on, dear friends, feed on.

Capsules of wisdom:

- Acupuncture is nothing new. My wife has needled me for years.
- There was this cross-eyed discus thrower who never set any records but he sure kept the crowd on its toes.
- Reduce errors at work. Arrive late, leave early.
- When a will is read, heirs listen with probated breath.
- The correct time is the only thing you can be sure of with second-hand information.
- Congress is considering a tax on girdles. A width holding tax.
- Old lawyers never die, they just lose their appeal.
- Old mufflers never die, they just get exhausted.
- If water pollution gets any worse, walking on it will be a cinch.

Jealousy rears its lovely head when Bob Ahlf (courtesy of Tom Miranda) returns with:

- Events in real life are closer or farther than they appear.
- Planning is a form of procrastination.
- Time will tell and if it doesn't, I will.
- Never expect anything!

Lou Eromenok, long-time observer on the scene at the New York Society, observes:

—Ollie North's defense plea .... "I read his lips."
—Lower capital gains tax .... to have and to hold.
—Medicare payments................ Manna, mañana!
—Military hardware .... screw ups.
—Democrats and Republicans........... give and take.
—Reagan's legacy to Bush .... no sex upstairs in the White House.

And now, back to the 1974 *Farmers' Almanac*—

A man gets on a train, a sleeper in New York City. He goes up to the porter and says, "Look, I want to get off in Richmond, Virginia, but once I'm asleep it's very difficult for me to wake up. Sometimes, I'm nasty and I don't know what I'm saying. Here's 10 dollars. Please, no matter what I say, wake me up and get me off that train in Richmond." The man wakes up in Raleigh, NC, and he's furious. He finds the porter, screams and yells and takes a swing at him. Then he gets off the train. The conductor sees what's going on, goes up to the porter and says, "What happened? I never saw anyone get that mad." The porter answers, "That's nothing, you should see the guy I put off in Richmond."

* * *

Deft-a-Nitions

Suitcase .... Flee bag
Housework .... Mop art
IOU....................... Paper wait
Bunions.................. Ache corns
Trouble shooter .... Deficiency expert
Spring .... A root awakening

Ode to Urban Blight

When I awoke this morning
To a dark and dingy dawn
I put on my new spectacles
And suddenly was reborn.
There in all its splendor
Was a world I'd never known.
Graffiti, dirt and shmutz,—
From my lips there came a moan.
As I stared and scratched my head,
Made my decision—back to bed.
—Brother Joe

—Herb Hillman
Humbug's Nest
P.O. Box 135
Whitingham, VT 05361