Vol. 63 **No. 9** JOCCAB 63(9) 367-398 (1980) **September 1980**

EXHIBITION

OCCA-33
28–30 APRIL 1981

For details see page 392 and back cover

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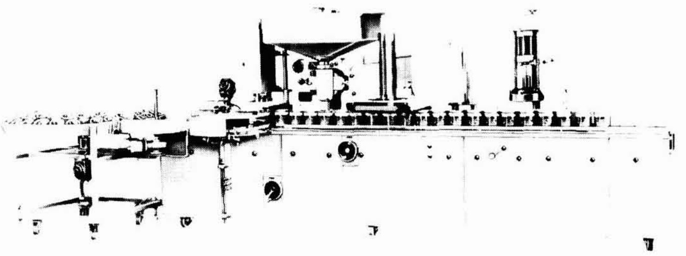

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Annual subscription to non-members: £40.00 ($100), post free by surface mail, payable in advance.

Single copies £4.00 ($10), post free by surface mail, payable in advance.

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J. Oil Col. Chem. Assoc. 1980, 63, 367-369

Transactions and Communications

Paints and painting problems in the tropics*

By F. B. Adefarati

Berger Paints Nigeria Limited

Summary

The climatic and environmental conditions in the tropics, with particular reference to Nigeria, are described. The effects of these conditions on paint, paint formulation and some aspects of paint performance are discussed.

Keywords

Types and classes of coatings and allied products

Alkyd coating
Latex coating
Water base paint

Types and classes of structures or surfaces to be coated

concrete
masonry
wood

Properties, characteristics and conditions primarily associated with the environment

ambient temperature
humidity
relative humidity
tropical environment

Miscellaneous terms

biodegradation
pollution

Peintures et les problèmes de peinturage sous les tropiques

Résumé

On décrit à l'égard particulier de Nigéria, les conditions et climatiques et environnmentales sous les tropiques. On discute les effects de ces conditions sur peintures, et sur certains aspects de la formulation de peintures.

Anstrichstoffe und Lackierenprobleme in den Tropen

Zusammenfassung

Die klimatischen und die umweltlichen Bedingungen in den Tropen werden hauptsächlich in betrug auf Nigeria beschrieben. Die Wirkungen dieser Bedingungen auf Austrichstoffe und Lackformulierung werden besprochen.

Introduction

This paper is restricted to a discussion of how local conditions effect the formulation of paint and its subsequent performance. It is concerned mainly with decorative paints, with only minor reference to industrial paints. The paper is based upon the author's experiences in West Africa, and particularly in Nigeria, however, it is believed that similar climatic conditions must exist in other areas and have similar effects.

The following are common factors which should be taken into account when formulating paints for use in these regions:

1. Climatic factors which may be subdivided into:
   (i) Relative humidity
   (ii) Temperature
   (iii) Rainfall
   (iv) Salty and riverain conditions (Ecological conditions)
2. Biological factors
   (i) Fungal growth
   (ii) Algal growth
   (iii) Bacteriological attack
3. Building construction (walls etc.)
4. Other factors, such as "soiling" due to, for example, industrial pollution, Harmattan dust etc, all of which are important.

Considering these factors in more detail, it is evident that when discussing the climatic conditions the predominating influence is the alternating wet and dry seasons, each of about six months duration; this has little influence on whether or not painting work is carried out because painting is performed virtually throughout the year.

Relative humidity

The average relative humidity varies between 78 and 85 per cent, which is considered to be high. Fog is rare, but early morning mists are not uncommon in the South and, except in uncleared jungle areas, there are few protracted periods of damp.

The overall result is an alternating inward and outward movement of moisture across painted surfaces, which causes cracking and provides suitable conditions for fungal growth.

*Paper presented to the Nigerian Branch of OCCA on 4 December 1979

Temperature

The temperature, on the average, ranges from 28°C in the South to 38°C in the North. Its effect is not very serious with decorative paints, but it can lead to rapid gelation of some industrial paints, e.g. stoving enamels, within a period of three to four months. This necessitates the inclusion of anti-gelling agents and the avoidance of fast curing melamine-formaldehyde resins in some tropical formulations.

Rainfall

Rainfall does not seem to have much effect, except that it enhances the growth of algae, especially during the wet season. There is, however, a complete freedom from frost and industrial fog; doors and windows are usually kept open, so that there is no temperature or humidity gradient which might cause blistering, and drying conditions are good, even during the wet season. The amount of sunshine during the year is less than might be expected, owing to periods of "Harmattan" and overcast conditions. Experience with panels fully exposed, facing South and at an angle of 45° indicates that the effect of sunshine does not seem to be of great significance in the deterioration of paints. An indirect effect of sunshine is its contribution to the movement of moisture through painted surfaces.

Other ecological conditions (salty and riverain conditions)

The Federal Capital of Nigeria is located on the West coast and its salty environment does have an effect on the performance of paint. The Federal Territory alone consumes about 25-50 per cent of Nigeria's paint production. The effect of industrial pollution and pollution from oil production cannot be disregarded, especially in Port Harcourt. Efflorescence is common in Lagos and Port Harcourt. Corrosion is another problem that needs to be watched and because of its prevalence, the Nigerian Federal Military Government has set up a special group within the Standards Organisation to look at the problems of steel and vehicle corrosion in Nigeria, particularly in the South of the country.

Rate of corrosion in Lagos

According to BISRA the rate of rusting of steel in Lagos is reported as 0.615 mm/year. This corrosion rate is rather high when compared with most other climates. The magnitude of this rate can be appreciated better from the statement that an iron ingot 3.2 mm thick would be completely rusted on both sides in about 2.5 to 3 years.

Wall construction

This is invariably with sandcrete having a ratio of cement:sand of 1:6. Building blocks are rendered on both faces with cement/sand mortar. In the coastal areas, beaches, lagoons, for example Lagos and Port Harcourt, the sand may contain salts and buildings are usually subjected to torrential rain at various stages of their construction and hence the resulting conditions can be very severe on alkyd based decorative paints.

Fungal growth

This is an unavoidable problem in Nigeria. This can be considered in two categories, (i) biodeterioration of aqueous based paints during storage, i.e. in-can deterioration and (ii) biodeterioration of the paint film.

Factors directly related to the growth of fungi, some of which have been mentioned above, include moisture, temperature, texture, surface dirt, the chemical nature of the substrate, pH (where it is eight or less) and the availability of useable nutrients.

Algal growth

Algal growth is also related to the presence of moisture and is more common in the wet season. It does not usually require a supply of organic nutrients from the substrate, but does need some sunlight for photosynthesis. The climatic conditions in Nigeria are favourable for the growth of this type of organism.

It should be noted that from the author's experience alkalinity, such as that from concrete, does affect algal growth by inhibiting the competitive growth of fungi. Since the more permeable films, such as latex paints, may permit alkalinity from underlying concrete to reach the surface due to water transport, such films, e.g. emulsion paints are more susceptible to algal growth than are alkyd paints.

The following fungi/algae have been isolated from paint films in Nigeria:

1. *Trentepohlia umbrina* causes yellow, orange-red staining on walls. This is a notorious alga in Nigeria.
2. *Phoma violacea* produces a pinkish violet colouring matter which leaches into the paint medium. Even if further coats of paint are applied over the stain the colour will continue to leach through successive coats.
3. Another important alga which causes serious problems in Nigeria is *Cladosporium herbarum* which is found both on the exterior and in the interior of buildings, producing a greyish-green or brown growth depending upon its situation.
4. *Trichoderma sp.* is a common organism producing a bright blue/green growth.

Bacteriological attack

The baterium *Aerobacter aerogenes* is associated with the gassing of emulsion paints and the subsequent degradation of the protective colloid by the cellulose destroying enzymes produced by this gram-negative rod shaped bacterium.

Effective biocides

Important factors in the suitability of biocides include toxicity, volatility, washability and resistance to chemical changes caused by hydrolysis, breakdown by UV light and conversion to an inert or volatile form by some chemical action. Whilst it is difficult to obtain a biocide which would satisfy all the above conditions, attempts are being made to find some acceptable compromise between these requirements.

A few of the preservatives which have been examined are:

1. Tetrachloro-4-methyl sulfonyl pyridine. This shows poor resistance to hydrolysis, it loses its effectiveness

on storage and hence it is not suitable as a preservative.

2. Sodium pentachlorophenate. An in-can preservative but it darkens on exposure to light when the paint is applied. Its toxicity gives rise to handling difficulties.

3. Tetramethyl thiuram disulfide. Appears to be effective as an algicide, but was found to cause yellow staining in the can.

4. Barium metaborate. Found to be effective only at high concentrations.

5. Phenyl mercury nonane 2-01. Appears to be fairly effective as a fungicide, but gives rise to staining problems. Mercurial compounds may be the subject of prohibitive legislation in the future.

6. 1:2 Benziso thiazolone. Is useful only as an in-can preservative as it tends to migrate into the resin phase of the paint and therefore leaves the water phase unprotected.

7. 1:2 Benziso thiasoline. In-can preservative only, but causes discolouration.

8. Dichlorophene. Useful only as an in-can preservative.

9. Tributyltin oxide. Fairly effective as a fungicide, but not as an in-can preservative. It leaches out from the paint surface in the course of time. Some organotin compounds may be toxic to mammals.

10. An organo ethoxy derivative was found to be effective as an in-can preservative.

11. Zinc omazine/polybrominated salicylanilide. Effective as an in-can preservative.

Staining problems

A mercurial fungicide would probably satisfy most requirements, but recent experience in Nigeria has shown that some compounds are prone to problems, in spite of the fact that there are no local restrictions on the use of mercurials in paints made or used in Nigeria.

One serious problem is mercury (grey) staining. It has been found that under very humid conditions the mercury present reacts with certain sulfur compounds to form the black sulfide. This effect is found to be localised in the Southern parts of Nigeria. Traces of sulfur may occur as hydrogen sulfide or as sulfur dioxide and it is not surprising that these problems are localised to the coastal and industrialised areas of the country, such as Lagos and Port Harcourt where petroleum is produced.

Effect of moisture

Experience in Nigeria has shown that condensation appears and disappears in patches, and that some areas stay wet longer than others, the wetter areas blacken more readily than those which are drier for longer periods.

Suggested remedies

1. Abandon the use of mercurial fungicides

2. In places where damage by staining has occurred, the following treatment has been found effective:
   (i) Wash stained area with sodium hypochlorite solution (10 per cent)
   (ii) Rinse with water and allow to dry
   (iii) Apply one coat of an alkali resistant primer as a barrier coat
   (iv) Apply one coat of a mercury-free emulsion paint.

   It has been found from experience that if emulsion paint is applied directly on a surface oxidised by hypochlorite, staining reappears and hence it is essential to use a barrier coat.

3. Baterial attack (in-can). It is much better to prevent any outbreak of degradation in the can than to allow it to occur. The bacteria usually responsible have been mentioned above.

4. Sterilisation of plant. Adequate house keeping procedure is essential to avoid contamination. In Nigeria the environmental conditions are very conducive to bacterial attack. Sterilisation at regular intervals is, therefore, essential.

5. Dispersion of fungicide. In addition to sterilisation, a fungicide should be added to the mill charge in order that it should be dispersed *in situ* as a colloid. This also reduces the risk of bacterial contamination.

6. Use of well or bore-hole water. Well water which is not deep is known to contain many contaminants such as bacteria, fungi and metallic elements, which can cause many problems. Regular analysis of the water used is, therefore, essential before using it for the production of emulsion paints. If the iron content, for example, is over 1 mg/l, this could cause staining of white or pastel shades and must be removed or reduced before the water is used.

Conclusions

It can be stated that the relatively high humidity of the atmosphere, the conditions suitable for the growth of fungi and algae, the industrial pollution and the high corrosion rate, specially in coastal areas, must account for not less than 80 per cent of the usual coatings problems encountered in Nigeria. These include cracking, flaking, growth of algae and fungi, chemical (mercurial) staining, bacterial (in-can) degradation and the corrosion of steel and vehicles.

It is necessary to take all these into consideration when formulating a paint system to give satisfactory performance in tropical regions and particularly in Nigeria.

[*Received 22 April 1980*

J. Oil Col. Chem. Assoc. 1980, 63, 370–372

Short Communication

Direct volumetric determination of n-butanol in nitrocellulose thinner

By R. Prakash* and I. C. Shukla
Department of Chemistry, Allahabad University, Allahabad-211 002, India

Keywords

Raw materials for coatings

solvents

solvent
thinner
butanol

Supplies and other materials primarily associated with analysis, measurement, or testing

analytical reagent

Introduction

Refs. 1-8

n-butanol is a well-known solvent for stoving enamels, nitrocellulose lacquers, polyamide flexo/gravure and shellac inks. It has a characteristic odour, acts as an effective solvent and maintains a balance in the evaporation rate of paint. On account of the above properties, a definite amount of n-butanol should be present in a thinner. In the paint industry it is a real advantage to know that the correct percentage of n-butanol is present in a thinner. Up to the present no method has been available for the determination of n-butanol in a nitrocellulose thinner.

In the present method we have described a direct titrimetric method for the milligram determination of n-butanol in nitrocellulose thinner conforming to ISS 1873 (1961) using an N-bromosuccinimide reagent. N-bromosuccinimide has already been reported for the determination of certain organic and inorganic compounds by bromination[1-4] and oxidation[5-8].

In the present method, a diluted solution of nitrocellulose thinner is titrated against N-bromosuccinimide using methyl red indicator. Here, only the n-butanol reacts with the reagent without there being any interference from the presence of other components of the thinner, e.g. butyl acetate and toluene. The method must be used in the milligram scale within an accuracy of ±1 per cent.

Experimental

Ref. 9

Reagents

N-bromosuccinimide (0.02M) solution

356 mg of N-bromosuccinimide was accurately weighed and dissolved in a minimum amount of hot distilled water. The solution was cooled, transferred and made up to 100 ml in a volumetric flask with distilled water. The solution was prepared fresh and standardised iodometrically[9].

Glacial acetic acid (AR, BDH)

Methyl red indicator

0.04 per cent w/v solution in 95 per cent ethyl alcohol.

n-butanol (0.02M) solution (AR, BDH)

148.24 mg of the sample was weighed accurately and diluted with glacial acetic acid in a 100 ml volumetric flask.

The nitrocellulose thinner was prepared by the method described in ISS 1873 (1961). In this thinner the n-butanol samples used were of a commercial grade conforming to ISS 361 (1973).

Thinner solution

A dilute solution of the thinner for the determination was prepared by diluting 1 ml of thinner in a 100 ml volumetric flask with glacial acetic acid.

Procedure

Aliquots of the diluted thinner solution, 1 to 12 ml, were placed in 100 ml conical flasks. 5 ml of glacial acetic acid was added and the contents were thoroughly shaken. Two drops of methyl red indicator were added and the contents were allowed to stand for one minute. The reaction mixture was titrated against a 0.02M solution of N-bromosuccinimide. The end point of the reaction took place at the disappearance of the pink colour of the methyl red indicator. A blank was also run under identical conditions using all other reagents except the thinner solution. The amount of n-butanol was then calculated from the difference in the titre value of the blank against the test mixture.

Calculation

$$\text{mg of butanol} = \frac{74.12 \times (A-B) \times C}{356}$$

Where: A = Volume of N-bromosuccinimide, test mixture (ml)

B = Volume of N-bromosuccinimide, blank (ml)

C = Concentration of N-bromosuccinimide in mg/ml.

*Singhal Paint Company, Lucknow-226 004, India

Table 1
Molarity of N-bromosuccinimide using n-butanol

Volume of n-butanol (0.02M) solution, (ml)		1	2	3	4	5	6
Volume of N-bromosuccinimide (0.02M) solution, (ml)	1.	2.04	4.02	6.08	8.02	10.10	12.00
	2.	2.06	4.06	6.10	8.04	10.12	12.08
	3.	2.02	4.08	6.02	8.06	10.08	12.10

Results and discussion

Before applying the method to the analysis of the thinner sample, the reaction was tested quantitatively with a pure sample of n-butanol at milligram level. The stoichiometry of the reaction was established in the following way.

Aliquots of 1 to 6 ml of n-butanol solution were placed in 100 ml conical flasks followed by the addition of 5 ml of glacial acetic acid and two drops of methyl red indicator. The mixture was titrated against standard 0.02M N-bromosuccinimide solution with continuous shaking until the red colour of indicator disappeared. Molarity was calculated on the basis of the N-bromosuccinimide reagent consumed (Table 1).

The stoichiometry of the reaction was found to be 1:2 as indicated in Table 1. Three readings were recorded for each case. The effect of glacial acetic acid and N-bromosuccinimide concentration was also studied. It was found that 5 ml of glacial acetic acid was sufficient for complete ionisation of N-bromosuccinimide and that 0.02M N-bromosuccinimide solution was sufficient for accurate results.

The experimental method used on the n-butanol sample was also used for the determination of n-butanol in the nitrocellulose thinner (Tables 2, 3).

The reaction between N-bromosuccinimide and n-butanol was established in the following way. The n-butanol sample was allowed to react with N-bromosuccinimide reagent for 10 minutes in the presence of 5 ml of glacial acetic acid in a 100 ml conical flask. The whole operation was carried out at room temperature (27°C). After the reaction was complete the reaction mixture was placed in a water bath and heated for 10 minutes to remove the unreacted bromide. The clear solution obtained in this way was acidified with dilute HNO_3 and few drops of 10 per cent $AgNO_3$ solution were added. The yellow precipitate developed in this way was dissolved in excess ammonium hydroxide. It showed the presence of hydrogen bromide in the reaction mixture. Another portion of the clear solution was evaporated to dryness.

Table 2
Determination of n-butanol using 0.02M N-bromosuccinimide solution

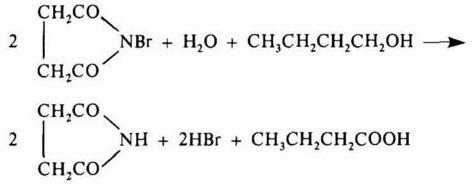
Aliquots (ml)	Amount present (mg)	Amount recovered (mg)	No. of determinations	Percentage error
1	1.482	1.502	3	+ 1.34
2	2.964	2.972	3	+ 0.26
3	4.446	4.458	3	+ 0.26
4	5.928	5.946	3	+ 0.30
5	7.410	7.428	3	+ 0.24
6	8.892	8.870	3	− 0.24

Table 3
Determination of n-butanol in nitrocellulose thinner using 0.02M N-bromosuccinimide solution

Aliquots (ml)	Theoretical value present (mg)	Amount recovered (mg)	Percentage deviation
1	2.010	2.034	+ 1.19
2	4.020	4.052	+ 0.79
3	6.030	6.094	+ 1.06
4	8.040	8.102	+ 0.77
5	10.050	10.108	+ 0.57
6	12.060	12.098	+ 0.31
7	14.070	14.112	+ 0.29
8	16.080	16.128	+ 0.29
9	18.090	18.120	+ 0.11
10	20.100	20.188	+ 0.43
11	22.110	22.212	+ 0.46
12	24.120	24.226	+ 0.43

The solid mass was extracted with alcohol and it was identified as succinimide.

On the basis of the above experiment and the stoichiometric ratio between n-butanol and N-bromosuccinimide a possible course for the oxidation of n-butanol is given below.



[*Received 6 February 1980*

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J. Oil Col. Chem Assoc. 1980, **63**, 373–378

Studies on adhesion: Effect of part replacement of TiO_2 by ZnO or extenders in alkyd based TiO_2 paints

By M. N. Sathyanarayana, P. S. Sampathkumaran and M. A. Sivasamban

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Summary

Adhesion to the substrate is an important property of surface coatings. In the present work the effect of part replacement of titanium dioxide (anatase) with zinc oxide or one of the extenders, barytes, china clay or talc in paints prepared from a conventional alkyd at critical pigment volume concentration (CPVC) on the adhesion of the paints to mild steel substrates has been studied. The practical adhesion values of the paint films have been determined by the sandwich pull-off technique using a Hounsfield Tensometer.

Keywords

Raw materials for coatings
binders (resins etc)

alkyd resin

prime pigments and dyes

anatase titanium dioxide
zinc oxide

extender pigments

barytes
clay
talc

Types and classes of structures or surfaces to be coated

steel

Processes and methods primarily associated with materials in general

absorption
sandwich pull-off technique

Des études sur l'adherence: l'effect sur peintures alkydes à base de TiO_2, du remplacement partiel de TiO_2 par ZnO ou les matières de charge

Résumé

L'adhérence au subjectile est une caractéristique importante des revêtements de surface. Au cours des recherches actuelles, on a étudié l'effet qu'exerce le remplacement partiel du dioxyde de titane (anatase) par l'oxyde de zinc ou par une des matières de charge suivantes: barytine, kaolin ou talc, en peintures à la concentration pigmentaire critique en volume, et préparées à partir d'une résine alkyde conventionnelle, sur l'adhérence des peintures aux subjectiles en acier doux. On a déterminé les valeurs d'adhérence dans la pratique, au moyens de la technique d'arrachage en utilisant le tensomètre d'Houndsfield.

Adhäsionsuntersuchungen: die Wirkung auf TiO_2-erhaltene Alkydanstrichstoffe von der teilweisen Ersetzung des Titandioxyds mittels ZnO oder Füllstoffe

Zusammenfassung

Die Adhäsion am Substrat gilt als eine wichtige Anstricheignschaft. In der vorliegenden Untersuchung wurden, hinsichtlich der an der kritischen Pigmentvolumenkonzentration hergestellten konventionellen Alkydharzlacken, die Wirkung, auf die Adhäsion der Anstrichstoffe an Substraten aus niedriggekohltem Stahl, der teilweisen Ersetzung des Anatastitandioxyds von Zinkoxyd oder von einem der folgenden Füllstoffe untersucht: Baryt, Porzellanerde, Talk. Die praktischen Adhäsionswerte der Anstrichfilme wurden mittels der Abreisstechnik und des Houndsfield'schen Tensometeters bestimmt.

Introduction

Ref. 1

The importance of adhesion in dealing with surface coating materials has been emphasised by many workers. Different aspects of the phenomenon of adhesion such as the nature of forces involved and factors affecting adhesion have been studied and various methods have been devised for the measurement of practical adhesion.

Although the nature of the pigment or extenders used in a paint could be expected to affect the adhesion properties of the paint, this aspect does not appear to have been studied in detail so far. In the present study the effect of a part replacement of TiO_2 in alkyd based TiO_2 paint, formulated to a critical pigment volume concentration (CPVC), by zinc oxide or one of the extenders, barytes, china clay or talc on the adhesion of the paint to mild steel substrate has been investiaged. The study has been confined to the modification of TiO_2 alkyd paint formulated at

CPVC since earlier work[1] has shown that the alkyd based TiO_2 paints attain the maximum practical adhesion value at CPVC; most other paint properties also attain their optimum values at this level of pigmentation. Apart from practical adhesion, other properties such as tensile strength and percentage elongation, gloss and scratch hardness have also been determined.

Experimental

Ref. 1

Materials

Medium

Alkyd resin (66 per cent oil length) was prepared by the standard monoglyceride process using linseed oil, glycerine and phthalic anhydride. The alkyd had an acid value 6.5 mg of KOH per gram of material, a hydroxyl value 37.7 mg of KOH equivalent to the hydroxyl content of one gram of material, an average molecular weight of 1987 and a density of 1.00.

Pigments and extenders

Titanium dioxide

Pigment grade titanium dioxide (anatase, Travancore Titanium Products, India), specific gravity 3.84, oil absorption 25.1 and identified as TiO_2(anatase) tetragonal from X-ray diffraction pattern.

Zinc oxide

Pigment grade zinc oxide, specific gravity 5.60, oil absorption 16 and identified as ZnO hexagonal from X-ray diffraction pattern.

China clay

Commercial extender grade china clay, specific gravity 2.54, oil absorption 41 and identified as Kaolin from X-ray diffraction pattern.

Barytes

Commercial extender grade barytes, specific gravity 4.4, oil absorption 10 and identified as $BaSO_4$ ortho-rhombic from X-ray diffraction pattern.

Talc

Commercial extender grade talc, specific gravity 2.77, oil absorption 43 and identified as talc monoclinic from X-ray diffraction pattern.

Solvents

Rectified xylene (BDH), b.p. 138°C; white spirit (Burmah Shell) b.p. range 150-200°C; methyl ethyl ketone (extrapure, E.Merck) b.p. 79.6°C.

Driers

Cobalt naphthenate (6 per cent cobalt, metal content) and lead naphthenate (24 per cent lead, metal content) in xylene.

Emery paper

Emery papers of grade nos. 180, 220, 320 and 400 (in increasing order of fineness), silicon carbide waterproof paper of Carborundum Universal Ltd, India.

Mild steel discs and panels

Mild steel discs of diameter 32 mm punched out of a plate of gauge 20 (0.9 mm), abraded with emery paper of increasing order of fineness in white spirits medium, swabbed successively with xylene and finally degreased in a soxhlet extractor with methyl ethyl ketone for two hours. The residual solvent from degreased specimens was removed in a vacuum desiccator and paints were applied afterwards.

The mild steel panels of size 150 × 100 mm were cut out of a plate of gauge 20 (0.9 mm), abraded with emery papers of increasing fineness in white spirits medium, and swabbed successively with xylene.

Tin panels

Panels of size 150 × 50 mm were cut out from electrolytically tinned mild steel (0.315 mm). The tin panels were lightly abraded with a fine emery paper and swabbed with xylene.

Tin foil sheets

Tin foil sheets of size 200 × 100 mm and 0.025 mm thickness were used.

Paints

Alkyd based TiO_2 paint was prepared by formulating at the CPVC value[1] (i.e. 35 per cent PVC). A set of paints were prepared by substituting part (10, 20, 30 and 40 per cent by weight) of the TiO_2 in the paint with ZnO or the extenders china clay, barytes or talc. The paints were prepared by grinding to Hegmann gauge 7-8 in a laboratory ball mill, after which they were filtered through a fine muslin cloth and thinned to a brushable consistency (60 seconds, Ford cup No. 4) or spin coating consistency (50 seconds, Ford cup No. 4) as required, by diluting with a suitable quantity of xylene-white spirit mixture (1:1 v/v). Driers were added (0.05 per cent cobalt and 0.5 per cent lead as metals on the weight of the binder) and mixed into the paint formulation and the paints were stored in closed bottles for a period of 24 hours for maturing.

Methods

Refs, 2-6

Determination of pigment-alkyd absorption

It has been found[2] that if the alkyd absorption values of the pigments/extenders were determined in place of their oil absorption values and used in calculating the CPVC of the paints concerned, the CPVC values would be much closer to the values determined by using other methods such as tensile strength, elongation or adhesion.

For the determination of the alkyd absorption value the following modified method was employed. Using alkyd resin (100 per cent solids) in place of linseed oil, a known weight of the alkyd resin (2-3 g) was placed on a glazed tile and small portions of the weighed pigment were added to the alkyd. The mixture was pressed, rubbed and rolled with the aid of a palette knife till a putty-like consistency was formed. The amount of pigment used up in the experi-

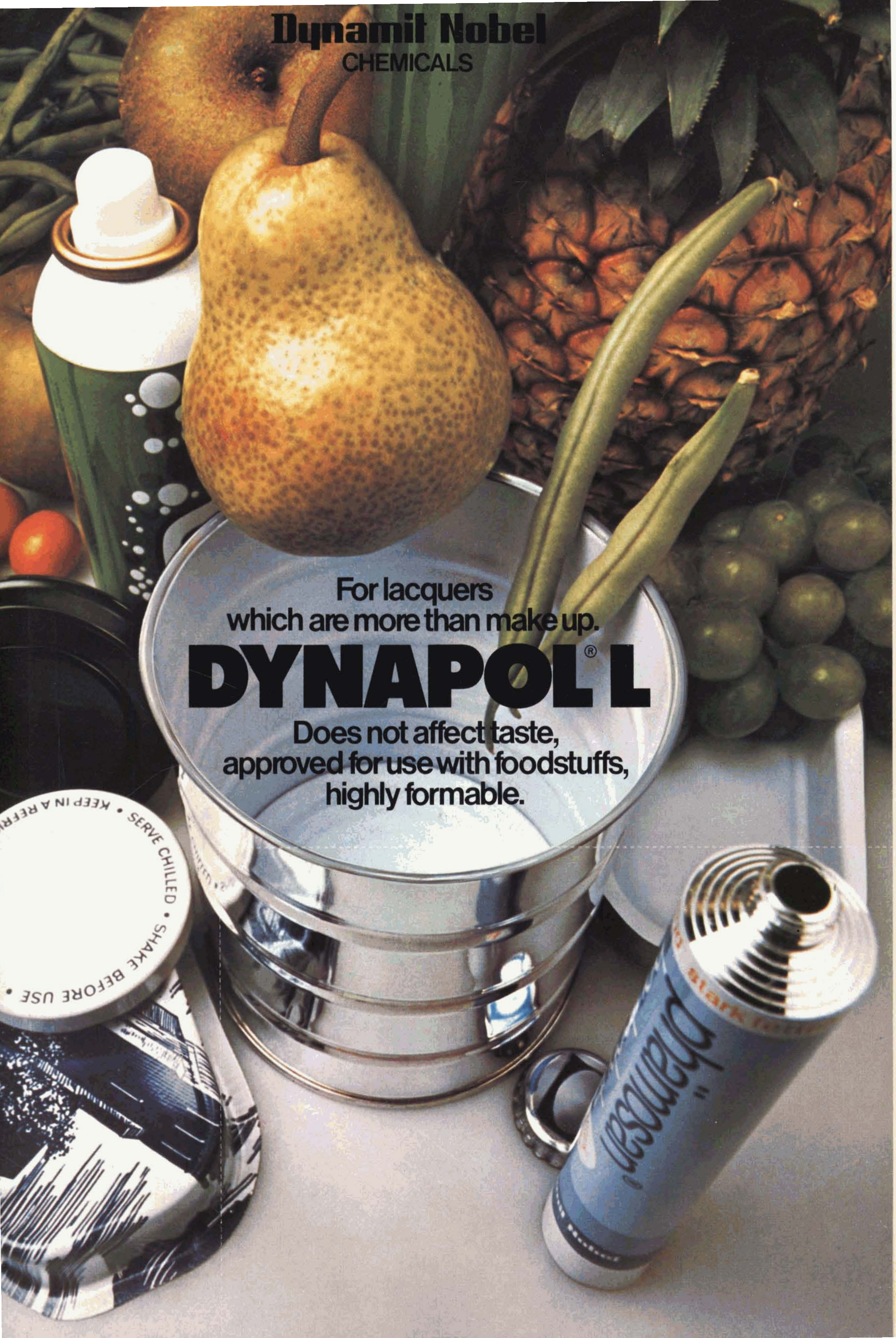
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Table 1

Alkyd absorption values of TiO_2 and its combinations with zinc oxide/extenders and calculated CPVC values of corresponding paints

No.	Percentage replacement of TiO_2	Name of pigment/ extender combinations	Calculated PVC of the system after replacement	Weight of alkyd absorbed by 100 g of pigment/extender (g)	CPVC calculated from alkyd absorption
1.	0	TiO_2 (anatase)	35.00	41.64	38.48
2.	10	TiO_2 + zinc oxide	34.24	38.60	39.19
3.	40	TiO_2 + zinc oxide	31.94	35.40	38.36
4.	10	TiO_2 + barytes	34.66	37.60	40.54
5.	40	TiO_2 + barytes	33.71	34.20	41.87
6.	10	TiO_2 + china clay	36.05	44.50	37.46
7.	40	TiO_2 + china clay	39.05	48.00	38.56
8.	10	TiO_2 + talc	35.85	46.50	36.87
9.	40	TiO_2 + talc	38.52	50.00	36.97

ment was obtained by weighing the pigment that remained. The amount of alkyd needed for 100 g of pigment to form a putty was thus calculated. This value was taken as the pigment-alkyd absorption value.

The CPVC's of the paint systems were calculated using the following equation:

$$CPVC = \frac{V_1}{V_2} \times 100$$

where: V_1 = volume of 100 g of pigment
V_2 = Volume of 100 g pigment plus volume of alkyd at alkyd absorption

The results are recorded in Table 1.

Determination of adhesion by "Sandwich pull-off" technique

The bond strengths (practical adhesion values) were determined by sandwich pull-off technique using a Hounsfield tensometer[3,4].

The test specimens were prepared by applying paints to the mild steel dics with an ICI spin coater to a dry film thickness of about 1 to 1.5 mils (25-37.5 μm) and allowed to dry for seven days at room temperature. The test doublets were prepared by glueing the painted disc between two stainless steel cylindrical test pieces 2 ins. (50.8 mm) long and 1 in. (25.4 mm) in diameter. The test piece that was stuck to the painted face was turned down to 3/4 in. (19 mm) diameter, so that higher forces could be applied obviating the possibility of a break occurring between the coupling test piece and the unpainted side of the disc. For the bonding, an adhesive of suitably high bond strength (to the substrate and to the paint surface) was chosen so that failure occurred only at the paint-substrate interface or in the body of the paint film during the test. The adhesive system used for bonding was Araldite AW 106 and Hardener HV 953U (Ciba-Geigy Corporation). The bond strength to mild steel of this adhesive system was found to be ca. 4000 psi (280 kg/cm^2). During the curing of the adhesive the doublets were kept aligned on parallel rod jigs of the same diameter as the cylinders, enough pressure being applied to squeeze out the excess adhesive without starving the joints. Great care was exercised in laying the test doublets securely on the alignment block for proper alignment of the test specimens. The test doublets were kept under pressure for 48 hrs, to allow the adhesive to cure, the bowing effect of the doublets in the assembly being corrected by suitable clamping arrangements. When curing of the adhesive was complete, the doublets were taken out of the alignment blocks and kept in a vertical position for a further period of 12 hours. The doublets were then pulled apart by subjecting them to progressively increasing stress at a constant rate until failure of the adhesive joint took place. Sagging of the doublet in the tensometer was prevented by suitable holders. Based on the area of the bonded paint surface and the load indicated by the tensometer at the time of bond failure, adhesion was expressed as practical adhesion[5]. Cohesive failure refers to any break in the body of the paint film and adhesive failure describes the break between the paint and the substrate. Classification of the nature and extent of the failure was estimated by applying copper sulfate solution to the painted surface of the disc after test, then superimposing a transparent plastic sheet on which squares were engraved and then counting the number of squares of brown deposit. The average practical adhesion value was calculated from the results of 15-20 test specimens. The results are given in Table 2 and Figure 1.

Determination of the tensile strength and elongation of the paint films[6]

Tin foil sheets were coated with paints using an ICI film applicator and allowed to dry for seven days at room temperature. The electrically operated Gardner tensile strength and elongation apparatus was used for determining the tensile strength and elongation of the free films of the paints which were obtained by the amalgamation technique. The tensile strength (kg/cm^2) and percentage elongation values are given in Table 3.

Determination of gloss of paints

The gloss of paint films was measured using a Gardner multi-angle glossmeter. The results are given in Table 4.

Determination of scratch hardness

Tin panels were coated with paint by brush coating and dried for seven days at room temperature. Scratch hardness was measured on an automatic power operated test unit (Research Equipment London Ltd). Results are tabulated in Table 4.

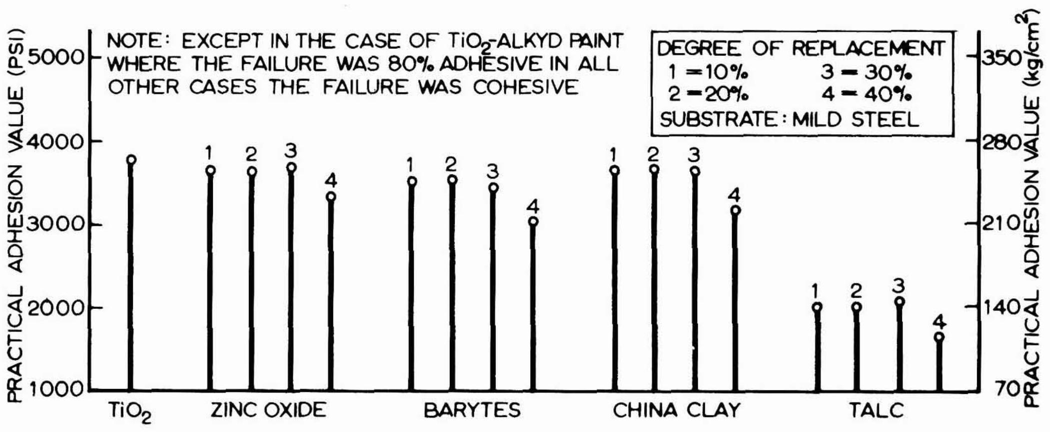

Figure 1. Practical adhesion values of alkyd-TiO_2 paints with part replacement by zinc oxide/extenders

Discussion

Since the part replacement of TiO_2 by zinc oxide or the extenders has been done on a weight basis, the first point to be considered is the effect of such a replacement on the PVC of the paint *vis-a-vis* the CPVC of the system. The CPVC values of the modified paint systems have been arrived at from the alkyd absorption values of the respective TiO_2-ZnO or TiO_2-extender mixtures. A comparison of the PVC's resulting from the part replacement of TiO_2 with the corresponding CPVC's (Table 1) shows that, formulations with zinc oxide and barytes, have PVC's that are well below the CPVC whereas, in the case of china clay and talc the PVC's are equal to or slightly higher than the CPVC's.

The replacement of TiO_2 with zinc oxide or extenders to the extent of 10 per cent lowered the practical adhesion of the paint, the negative effect being least with zinc oxide, followed by china clay and barytes and being most marked with talc (Table 2, Figure 1). In all cases of part replacement the type of failure changed from predominantly adhesive to cohesive failure. The practical adhesion values did not change much with increased replacement of TiO_2 up to a value of 30 per cent, but at 40 per cent replacement there was a significant fall in the practical adhesion values. The change in type of adhesion failure from predominantly adhesive to cohesive can be related to a decrease in the tensile strength of the free films of the paints, where there was a part replacement of TiO_2 with zinc oxide or extenders (Table 3). The results also

Table 2

Practical adhesion values of conventional alkyd TiO_2 paints with part replacement by zinc oxide/extenders

No.	Percentage replacement	Practical adhesion values (kg/cm^2), standard deviation and percentage failure				
		TiO_2 only	TiO_2 + zinc oxide	TiO_2 + barytes	TiO_2 + china clay	TiO_2 + talc
1.	0	260.40 4.21 80 AF				
2.	10		251.30 5.25 CF	240.80 9.10 CF	251.09 2.42 CF	135.10 4.23 CF
3.	20		242.55 4.26 CF	244.30 2.82 CF	252.00 6.30 CF	139.30 2.80 CF
4.	30		253.40 8.41 CF	236.60 8.76 CF	249.20 8.31 CF	144.20 8.40 CF
5.	40		229.60 9.80 CF	208.39 6.71 CF	217.00 4.91 CF	112.70 4.56 CF

Key: AF = Adhesive Failure
CF = Complete Cohesive Failure

Acid value of the medium: 6.5 mg of KOH per gram of the material
Hydroxyl value of the medium: 37.7 mg of KOH equivalent to the hydroxyl content of one gram of the material
Substrate: Mildsteel

Table 3

Tensile strength and percentage elongation values of free films of alkyd TiO_2 paints with part replacement by zinc oxide/extenders

No.	Percentage replacement	Pigment/extender combinations	TS (kg/cm^2)	Percentage elongation
1.	0	TiO_2	55.00	29.00
2.	10	TiO_2 + zinc oxide	57.50	30.00
3.	40	TiO_2 + zinc oxide	48.89	31.00
4.	10	TiO_2 + barytes	43.33	21.00
5.	40	TiO_2 + barytes	40.00	12.00
6.	10	TiO_2 + china clay	42.50	30.00
7.	40	TiO_2 + china clay	33.12	33.00
8.	10	TiO_2 + talc	40.00	13.00
9.	40	TiO_2 + talc	28.75	6.00

The thickness of the dry film selected for the measurements = 80 μm

show that while replacement with zinc oxide and china clay does not effect the flexibility of the resultant paint films, replacement with barytes leads to a reduction in flexibility, this is more so with talc. With regard to the effect on gloss of the paints, it is seen from Table 4 that replacement with zinc oxide or china clay does not have any significant effect on the gloss up to a value of 30 per cent replacement. At 40 per cent replacement, while gloss in the case of zinc oxide remains unaffected, there is a definite decrease in the case of china clay. With barytes gloss increases significantly with 10 per cent replacement and remains steady until 30 per cent replacement, after which there is a slight decrease at 40 per cent replacement. With talc, there is a significant loss of gloss up to 30 per cent replacement after which it levels off. The gloss of the original TiO_2 paint is not high because it has been formulated at CPVC.

In the case of the scratch hardness of the paints (Table 4) replacement with zinc oxide has no significant effect. With barytes and china clay there is no significant effect up to 30 per cent replacement but at 40 per cent replacement the hardness is lowered. In the case of talc there is a gradual softening effect on the film with increasing percentages of replacement.

In considering the effects of part replacement of TiO_2 by zinc oxide and extenders on gloss and scratch hardness as discussed above, it has to be borne in mind that whereas the original TiO_2 paint is at CPVC, the paints obtained by replacement are at less than CPVC in the case of zinc oxide and barytes, and at or slightly higher than CPVC in the case of china clay and talc. From an overall view of the results on gloss and scratch hardness it can be concluded that the observed changes in the properties arising from part replacement of TiO_2 with zinc oxide or extenders is due to the combined effect of the nature of the pigment (ZnO/extenders) as well as the actual PVC *vis-a-vis* the CPVC of the resultant paints.

Conclusion

The present study has yielded useful and interesting data on the effect of titanium dioxide-zinc oxide or titanium dioxide-extender combinations on important paint properties like adhesion, scratch hardness, gloss, tensile strength and elongation. The results will be of great help to the paint technologist in the formulation of coatings with desired properties.

Acknowledgement

The authors gratefully acknowledge the help of their colleague, Dr. R. S. Balakrishna, in this work.

Table 4

Gloss and scratch hardness of alkyd TiO_2 paints with part replacement by zinc oxide/extenders

No.	Percentage replacement	Gloss (20°) (std. value 86)				Scratch hardness (g)			
		a	b	c	d	a	b	c	d
1.	0	56	56	56	56	1100	1100	1100	1100
2.	10	60	77	60	49	1100	1000	1100	1000
3.	20	61	77	58	25	1000	1000	1100	900
4.	30	61	76	56	5	1000	1000	1000	800
5.	40	58	65	46	3	1000	900	900	800

Key: a = part replacement by zinc oxide
b = part replacement by barytes
c = part replacement by china clay
d = part replacement by talc

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J. Oil Col. Chem. Assoc. 1980, **63**, 379–385

Titanium dioxide pigments in decorative emulsion paints

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Summary

The prime function of titanium dioxide pigments in paint is to introduce white opacity into the paint film. In order to fulfil this function quite a number of TiO_2 pigment grades have been brought onto the market and this has led to a situation where there are large differences between different grades, not only in their opacity characteristics but also in their influences on other important paint properties.

Beginning with a grouping of TiO_2 pigment grades on the basis of their analytical composition, this paper deals with factors that are important for utilising the opacifying capacity of TiO_2 pigments in an optimum way in emulsion paint formulations. Other influences of TiO_2 pigments are discussed in the order of their occurence throughout the different stages of paint in manufacture, storage, application and as the final decorative and protective paint film.

Keywords

Types and classes of coatings and allied products

gloss finish
emulsion paint

Raw materials for coatings

prime pigments and dyes

titanium dioxide
anatase titanium dioxide
rutile titanium dioxide

Processes and methods primarily associated with

manufacturing or synthesis

dispersion

Properties, characteristics and conditions primarily associated with

materials in general

dispersibility
opacity

bulk coatings and allied products

pot stability

coating during application

application characteristics
crazing

dried or cured films

durability

Les pigments du dioxyde de titane en peintures-émulsions décoratives

Résumé

En peinture le rôle principal des pigments du dioxyde de titane est de fournir l'opactié blanche au film de peinture. Afin de répondre en perfection à cette fonction, un bon nombre de pigments du dioxyde de titane a été mis au marché, ce qui a créé une situation où il existe des différences remarquables entre les divers types, non seulement dans le cas de leurs caractéristiques opacifiantes, mais aussi en ce qui concerne leur influence sur d'autres caractéristiques importantes de peintures. Cet article présente au début un groupement des types de dioxyde de titane basé sur leur analyse et il s'occupe alors des facteurs importants dans l'exploitation au maximum de l'opacité des pigments de TiO_2 au cours de la formulation des peintures-émulsions. On discute d'autres influences qu'exercent les pigments de TiO_2 après l'ordre qu'elles se présentent pendant les phases successives de la vie des peintures; fabrication, stockage, application et enfin du film protecteur et décoratif. Cet article conclut que l'opacité à part, les diverses caractéristiques des pigments de TiO_2 provoquent des différences en ce qui concerne les caractéristiques importantes de peintures comme suivant, la facilité de dispersion, les degrés de dispersion réalisables, la viscosité, la stabilité au stockage, l'étalement, le pouvoir éclaircissant, la blancheur et la clarté des couleurs, la porosité du film (mesurée au moyens de l'essai du "enamel hold-out", de la décoloration du film par Gilsonite, de la resistance mécanique, e.g., au frottement humide etc.) et la résistance aux intempéries. On a traité, dans une section particulière, l'influence notable qu'exerce la sélection du pigment de TiO_2 sur les caractéristiques des peintures-émulsions brillantes.

Titandioxydpigmente in dekorativen Dispersionsfarben

Zusammenfassung

Die Hauptfunktion der Titandioxydpigmente in Anstrichstoffen besteht aus der Einfuhrung der Weisse und des Deckvermögens in den Anstrichfilm. Um diese Funktion vollig zu erfüllen, hat man eine Menge Titandioxydpigmentqualitäten auf den Markt gebracht, so dass es bemerkswerte Unterschiede zwischen den verschiedenen Qualitäten gibt, nicht nur bei den Deckvermögenseigenschaften, sondern bei ihren Einflüssen auf die anderen wichtigen Anstricheigenschaften. Dieser Aufsatz beginnt mit einem auf der analytischen Zusammensetzung gegrundeten Gruppieren der Titandioxydsorten, und dann befasst sich mit den Faktoren, die, bei der Dispersionsfarbenformulierung, die optimale Benutzung der Titandioxydpigmente beeinflussen. Der Reihenfolge gemäss ihres Ereignisses im Laufe der verschiedenen Phasen des Anstrichlebens, d.h., Herstellung, Lagerung, Auftragen, sowie schliesslich der dekorative und schutzende Anstrichfilm, wurden die andere Einflüsse von Titandioxydpigmenten besprochen. Die Beschlüsse dieses Aufsatzes sind dass, ausser das Deckvermögen, die vers-

chiedenen Kennzeichen der Titandioxydpigmenten Verschiedenheiten in der folgenden wichtigen Anstricheigenschaften wirken: Dispergierbarkeit, erriechbare Dispergierungsgrade, Viskosität, Lagerbeständigkeit, Fliessfähigkeit beim Auftragen, Färbekraft, Farbtonweisse und -klarheit, Filmporosität (wie von Enamel Holdout-, Gilsont-, und mechanischen Beständigkeitsproben, z.b., Scheuerfestigkeit usw, bestimmt wird) und Dauerhaftigkeit. Der bedeutende Einfluss von der Auswahl des Titandioxydpigments auf die Eigenschaften der Clanzdispersionsfarben wurden als einen besonderen Punkt besprochen.

Table 1

Typical analytical figures and test values of titanium dioxide pigment types used in decorative emulsion paints

	TiO_2%	ZnO%	SiO_2%	Al_2O_3%	Rutile percentage	pH	Moisture %	Ignition loss %	Soluble salts %	Sieve residue 325 mesh %	Tint reducing power
1.	98.0	0.3	0.01	0.01	97.5	6–8	0.3	0.1	0.5	0.01	1650
2.	93.5	1.1	1.1	2.2	98.7	7–7.8	0.4	1.2	0.08	0.004	1800
3.	95.6	0.25	0.8	1.8	98.3	7–7.8	0.3	0.9	0.06	0.004	1840
4.	89.0	0.25	2.1	5.4	98.3	7.8–8.6	0.5	2.0	0.08	0.004	1750
5.	83.0	0.2	8.0	4.0	98.0	7–7.8	0.75	2.2	0.12	0.008	1700
6.	95.0	0.06	0.2	3.0	98.4	7–7.8	0.3	1.0	0.06	0.004	1900
7.	99.0	–	0.01	0.01	2.0	7–8	0.2	0.1	0.25	0.01	1300

Introduction

Scientifically speaking the commonplace use of the phrase "emulsion paint" is incorrect, but for the sake of convenience and owing to its general acceptance, it is used throughout in this paper for all aqueous decorative finishes where the binder does not form a true solution in water. Specifically, the most important binders for these paints are polyvinyl acetate, acrylic resins, vinyl/acrylic copolymers and styrene/acrylic copolymers, but in principle the following applies for instance to alkyd emulsion and styrene/butadiene latices as well.

In commercial decorative emulsion paints, besides the binder, titanium dioxide plays the most important role, being the white opacifying ingredient of the formulation; too often, however, its characteristics and potential are only partly known and understood. This in itself warrants attempts to shed more light onto the complexities of the behaviour of titanium dioxide pigments in emulsion paints.

Titanium dioxide pigment types for emulsion paints

Considering titanium dioxide pigments in emulsion paints, they can be divided into the following basic groups:

1. Uncoated rutile grades
2. Normally coated rutile grades for *exterior*/interior use
3. Normally coated rutile grades for *interior*/exterior use
4. Medium coated rutile grades
5. Heavily coated rutile grades
6. Special grades for gloss paints
7. Uncoated anatase grades

As is generally known, titanium dioxide pigments are produced either by the sulfate or chloride process. Each of the above can be produced by either process, and it must be emphasised that for the purpose of this paper, there is no reason for any subgrouping, so similar are the sulfate and chloride process pigments, the final performance depends on the quality of the pigment grade itself and not on the process used to produce it.

Typical analytical figures and test values for each of these groups are shown in the Table 1.

ZnO is used in calcination to regulate rutilisation, for which the aim is 98 per cent or above. For pigments of each group, however, the desired rutilisation can be achieved without any ZnO, often in the sulfate process and always in the chloride process, and consequently there are also zinc-free pigments in each of the above groups. More typical, instead, are SiO_2 and Al_2O_3 which are intentionally precipitated as a coating onto the TiO_2 particle surface. The skill by which this surface coating process is carried out is the determining factor for a pigment's behaviour in a paint vehicle. In principle the methods used in the coating procedure are common to both sulfate and chloride processes.

Other values of properties listed in Table 1 reveal certain interesting facts of the general pigment characteristics, though they are principally quality control necessities which offer a guarantee of successful production when held constant. It must be realised, however, that except for the tint reducing power, two pigment grades can differ greatly, relatively speaking, in these properties and despite the differences perform equally well in the final paint formulation.

In titanium dioxide pigment technology it is generally accepted that the full, desirable pigment properties of titanium dioxide are achieved only by coating the TiO_2 crystals with inorganic compounds, mainly SiO_2 and Al_2O_3. A further treatment with organic compounds is used today in many grades, but here the virtues are more evident in solvent than water borne systems. Consequently uncoated grades are generally not used in higher quality emulsion paints. Uncoated rutile goes into formulations where the main quality requirements are some degree of white colouration and satisfactory application properties in the final ready-made paint. When quality requirements become more refined it is necessary to select a coated grade of groups 2-6 (Table 1). The possibility of using anatase for self-cleaning or controlled chalking in exterior whites is often quoted but its real value in emulsion paints, in this respect, is rather questionable.

Titanium dioxide pigments as an emulsion paint formulation ingredient

Opacity considerations

Table 2 presents a series of flat emulsion paint formulations in an exterior/interior range. Throughout these for-

Table 2

Emulsion paint formulations for testing opacity and tinting strength in PVC's from 40 per cent through to 70 per cent

PVC	40%	45%	50%	55%	60%	65%	70%
360 ml glass jars for milling on the ball mill bars, 150 g glass ballotini 8mm							
10% Pigmentverteiler N	1,3 g	1,4 g	1,6 g	1,8 g	1,9 g	2,1 g	2,2 g
10% Calgon	5,6 g	6,0 g	6,4 g	6,8 g	7,2 g	7,7 g	8,1 g
10% ammonia	7,0 g	6,5 g	6,0 g	5,5 g	5,0 g	4,5 g	4,0 g
Nopco NDW	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g
2% Methocel 90 HG	13,0 g	14,5 g	16,0 g	17,5 g	19,0 g	20,5 g	22,0 g
Water (distilled)	50,0 g	55,0 g	60,0 g	65,0 g	70,0 g	75,0 g	80,0 g
TiO_2-pigment	80,0 g	80,0 g	80,0 g	80,0 g	80,0 g	80,0 g	80,0 g
Finntalc M 05	13,0 g	14,5 g	16,0 g	17,5 g	19,0 g	20,5 g	22,0 g
Finncarb 6005	41,0 g	53,0 g	65,0 g	77,0 g	89,0 g	101,0 g	113,0 g
Overnight on the ball mill bars							
Nopco NDW after grinding	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g	0,5 g
20 min. on the ball mill bars							
Total contents of the mills	211,9 g	231,9 g	252,0 g	272,1 g	292,1 g	312,3 g	332,3 g
Finishing (Lenart-dissolver) (90% of the mill-base)							
Mill-base	191,0 g	209,0 g	227,0 g	245,0 g	263,0 g	281,0 g	299,0 g
Finndisp K 110 (55%)	113,0 g	104,0 g	94,5 g	85,0 g	75,0 g	66,0 g	57,0 g
2% Methocel 90 HG	18,5 g	20,3 g	21,9 g	23,6 g	25,2 g	26,8 g	28,5 g
Oxitol Acetate	7,0 g	7,0 g	7,0 g	7,5 g	7,5 g	7,5 g	7,5 g
Water when required	12,0 g	10,0 g	9,0 g	8,0 g	8,0 g	7,0 g	6,0 g

Pigmentverteiler N = a sodium salt of polyacrylic acid (dispersing agent)
Calgon = sodium hexametaphosphate (dispersing agent)
Nopco NDW = antifoaming agent
Finntalc M 05 = talc (particle size under 5000 nm)
Finncarb 6005 = calcite calcium carbonate (particle size under 5000nm)
Methocel 90 HG = hydroxypropyl cellulose (thickener)
Finndisp K 110 = vinylacrylic copolymer

mulations the quantity of TiO_2 represents 20 per cent of the total solids volume, which in emulsion paint formulations can be considered an optimum for opacity. Total PVC, as commonly expressed in emulsion paint formulations, has been adjusted by extenders, in this case, talc and calcite (calcium carbonate). Increasing the PVC means that there is less and less binder to envelope the pigment and extender particles and above the critical PVC more and more of these particles are only partly or not surrounded by the binder at all. At the same time the porosity of the dried paint film increases. In order to understand the role and behaviour of titanium dioxide in these conditions let us consider the opacity in a simplified practical way. The opacity produced by a white pigment in a paint film is a consequence of the difference in refractive indices between the pigment and surrounding medium. Below the critical PVC this medium is the binder, above the critical PVC we can say that this medium is a combination of the binder and the air. The refraction of light at the interfaces, pigment/extender/binder/air of a paint film leads to the scattering of light which is seen as the white opacifying effect. Taking the refractive index of air as 1, the refractive index of rutile TiO_2 is 2.7, whilst that of the main binders and extenders falls in the region of 1.5. Owing to the big difference between the refractive index of TiO_2 and that of the binders, a TiO_2 pigment particle, fully surrounded by a binder, has a very strong opacifying effect. This is not the case with extender particles because the difference between the refractive indices of extender and binder is minimal. There is good cause to define this opacifying effect as the "real opacity", for the importance of titanium dioxide pigments in paint technology is really based on this ability to scatter light very strongly.

The scattering of light in a paint film is a very complicated phenomenon; for practical purposes it is sufficient to know that it depends on the packing of the pigment particles in the paint film, as shown graphically for a standard titanium dioxide pigment grade in Figure 1. It can be seen that the real opacity of the paint film increases almost linearly with an increase in TiO_2 concentration

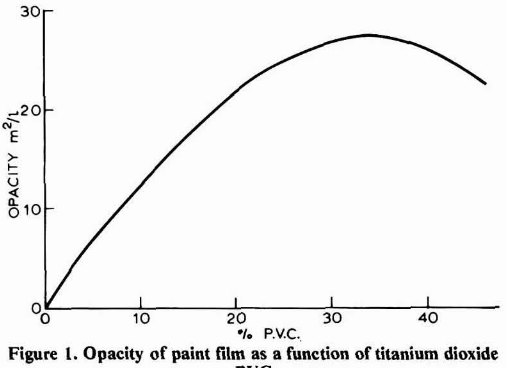


Figure 1. Opacity of paint film as a function of titanium dioxide PVC

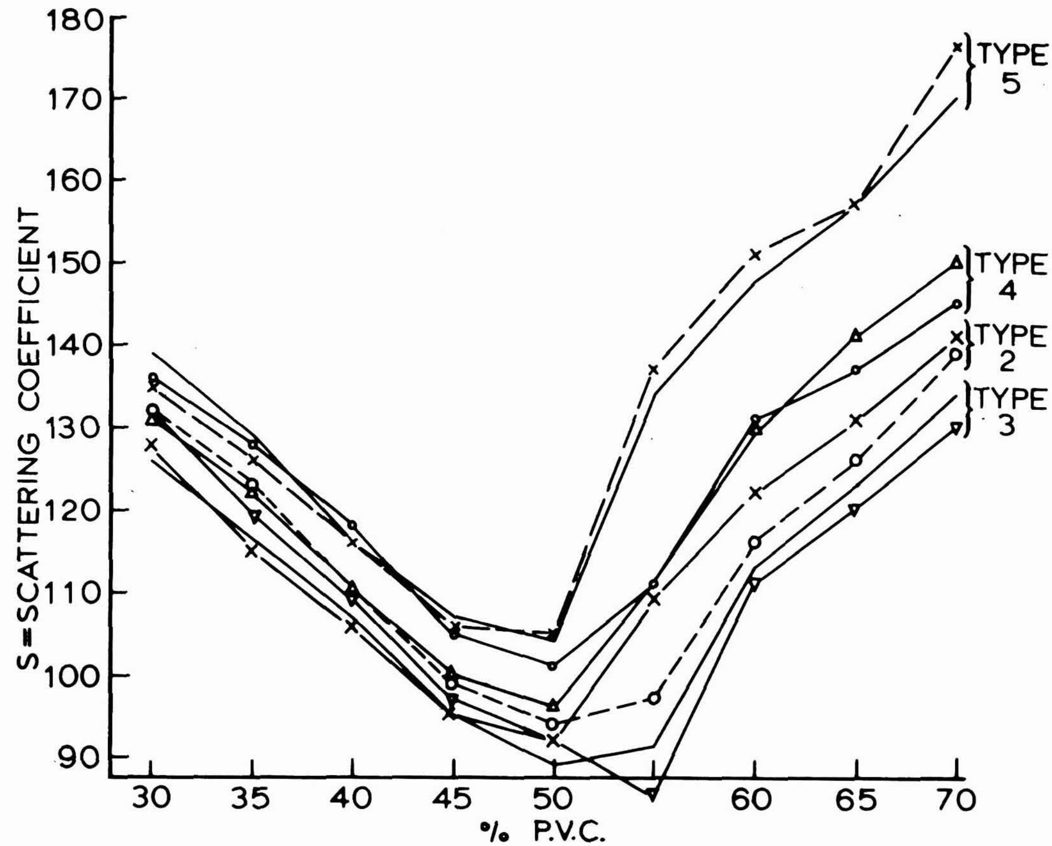


Figure 2. Relative opacities of different titanium dioxide pigment types in emulsion paint as a function of PVC

until 20 per cent PVC is reached, after which any further increase in opacity is reduced until the real opacity reaches a maximum somewhere around 34 per cent PVC. Any further addition of TiO_2 decreases the opacity from this maximum. It could be said that, for opacity, it pays to increase the TiO_2 concentration until 20 per cent PVC. Above this any extra achievable opacity becomes more and more expensive. For satisfactory opacity in commercial paints 15 per cent TiO_2 PVC can be considered normal and, as mentioned before, 20 per cent can be recommended as the optimum.

In the emulsion paint formulations presented here the 40 per cent PVC formulation still represents a situation where the paint opacity is equal to the real opacity, in other words the pigment and extenders are all fully surrounded by the binder; a further increase in extender concentration tends to reduce scattering by packing TiO_2 particles more densely together which can be seen in the series of opacity curves drawn for various pigment types in Figure 2. This downward trend of the opacity continues until the critical PVC has been reached. This, for decorative paints, is in the region of 50 per cent PVC, the opacity begins to increase again and this is caused by the increasing number of air interfaces in the paint film where the light is also refracted by the extender particles. This component of the total opacity is generally called "dry opacity" and it varies greatly from one extender to another depending upon their micro-structure. Also for different titanium dioxide pigment types there are considerable differences in their dry opacity, which has caused much confusion amongst paint formulators. Thus it can be concluded that the opacity of a paint film is equal to the sum of the real and dry opacities of the TiO_2 pigment and of the dry opacity of the extender:

Total opacity = Real opacity (TiO_2) + Dry opacity (TiO_2) + Dry opacity (Extender).

This simple equation is the basis for all developments with white pigments and extenders made in emulsion paints, in order to extend their covering power in practical use. We can say with some degree of accuracy that the real opacity (TiO_2) is in direct proportion to the analytical TiO_2 concentration of the pigment, that the dry opacity (TiO_2) depends on the pigment's inorganic coating type, and it can have an even lower value than the dry opacity differences between different types of extenders. Consequently there are two main ways to increase the opacity of an emulsion paint formulation above the critical PVC: 1. by replacing a standard TiO_2 pigment with a special (heavily coated) TiO_2 pigment grade or, 2. by changing the extender composition towards an extender type possessing high dry opacity. Both ways are very strongly advertised in trade magazines, again to the confusion of the paint formulator (the terms "high-opacity TiO_2" and the "TiO_2 replacing extender" are widely misused). The true effect of a "high-opacity TiO_2" is in making the paint film more porous and therefore it would be quite right to compare paints in Figure 2. horizontally and not vertically, as is commonly done when pigment comparisons are made. The claim would then be: With a standard TiO_2 pigment one can use more extender and less binder for the same opacity and for the same mechanical film properties. Again, the true effect of a "TiO_2 replacing extender" is not in replacing TiO_2 with an equivalent amount of this extender, but in changing the old, low dry-opacity extender to a new, high dry-opacity extender. In reality, therefore, it is not TiO_2 that is replaced but the original extender.

Any attempt to elaborate on these opacity considerations would lead beyond the scope of this paper, further practical aspects can be found in the references given below*.

Figure 2 shows that a 50:50 replacement of a normally coated rutile grade (types 2 and 3) with a medium coated rutile grade (type 4) has a relatively small effect on opacity compared to a really striking effect by replacement with a heavily coated rutile grade (type 5). In both cases when these types (4 and 5) were first introduced, the main sales argument was the increase in opacity achievable; consequently it might have been thought that the heavily coated grades would soon have made the medium coated grades obsolete. On the other hand, specifying the dry film properties and particularly the porosity, which in emulsion paint technology is better defined as "the enamel hold-out" or "the Gilsonite Test", it has been shown that the comparison, on a 50:50 replacement basis, is not warranted. Recognising this would seem to make the heavily coated rutile grades obsolete. Why then in practice do both medium and heavily coated rutile grades continue to be used successfully, even side by side with the old established normally coated rutile grades?

The answer is very logical: As a formulation ingredient, every TiO_2 type confers on the paint in all its stages: manufacture, storage, application and in its final state as a decorative and protective coating, different properties which, finally, are as important as the basic property, white opacity, which has rendered TiO_2 indispensible to the paint industry.

Dispersibility and state of dispersion

Let us consider first the paint manufacturing phase. As our series of formulations show, there are a number of ingredients offering many different possibilities of pigment/vehicle interactions. The most important property of TiO_2 pigment at this stage is its dispersibility, i.e. the ease by which the specified fineness-of-grind can be achieved. Normally the use of wetting and dispersing agents is required, the optimum quantity of which can vary greatly from one grade to another, and which too often has not involved sufficient attention to the final state of dispersion. Thus for exactly the same grindometer reading the final state of dispersion can be very different, even in gloss paints and still more in emulsion paints of varying degrees of flatness produced by coarse extenders, which efficiently hide the existence of even very large TiO_2 pigment agglomerates. The presence of these large agglomerates in the final paint film leads to a considerably reduced optical efficiency, and an impaired protective value.

From the viewpoint of paint manufacturing, the simplest way of changing a formulation towards, for example, a higher opacity is a 50:50 replacement. When carrying this out, usually the only other change which might turn out to be necessary is the addition of some water to the mill base, an operation which is not uncommon in manufacturing practice, even when there have been no changes in raw material. Usually the dispersion characteristics of the heavily coated TiO_2 pigment grades in water are felt to be an improvement on those of the normally coated TiO_2 pigment grades. Consequently, if there are any remarks from people in production about the use of a heavily coated TiO_2 grade instead of a normally coated one, these remarks more often than not favour the heavily coated grade. Reformulating back to a normally coated grade would require bigger changes in the formulation to satisfy the production personnel, and many paint producers feel that their facilities for this kind of reformulation are insufficient. This alone is a valid reason for the fact that the heavily coated grades are here to stay, and more reasons will turn up when other stages in the production and use of emulsion paints are considered. For some medium coated grades this same reason is valid too, but for their continued use in emulsion paint production, quality considerations in later stages are more decisive.

Storage stability

The storage of an emulsion paint is a very important criterion, when selecting a TiO_2 pigment grade for formulation. Owing to a great number of commercially available emulsions with widely varying properties, for use as binders for paint, the TiO_2/vehicle interactions are quite unpredictable. In some cases an unsuitable combination of a TiO_2 pigment grade and an emulsion grade can result in a gelling of the paint in only a few months. The reasons for the rapid increases of viscosity and the eventual gelling are still far from being fully understood, but a likely explanation may be found in the nature of the electric charges on the different paint ingredients, and the author believes that Zeta-potential measurements will elucidate the matter in the future. Surface active agents used to stabilise resin emulsions are often anionic, and a cationic surface treatment of a pigment would make its use together with an anionically stabilised emulsion entirely unsuitable, unless the electric charges are balanced by properly selected additives. These additives, fortunately, are usually present in emulsion paint formulations as dispersing agents (polyphosphates and polyacrylic salts) and very often somewhat in excess to the quantity required to perform the dispersing function satisfactorily. However, if a formulation has originally been developed for a certain TiO_2 pigment grade with the minimum quantity of dispersing agents, a 50:50 replacement for another TiO_2 pigment grade (which in an alkyd enamel, for instance, behaves as a perfect countertype of the former) may cause unpleasant surprises during storage. An increase in the dispersing agent quantity has been found to be a practical solution to restore the viscosity stability, but this of course is not always acceptable because of other side effects.

Other trials to explain the instability are often very superficial and misleading; one of them, the presence of

*Fred B. Stieg "The ABC's of white hiding power", *J. Coatings Tech.*, 1977 July, republished in *Pig. Resin Tech.*, 1978 January.

zinc oxide in the TiO_2 pigment needs to be mentioned separately because it is still claimed today that the instability of an emulsion paint was caused by the use of TiO_2 pigment grade stabilised with ZnO. It has been shown nevertheless that there are no grounds for this kind of generalisation. In large tests with critical formulations many TiO_2 pigment grades containing ZnO have produced fully stable paints, and again amongst the unstable paints many have contained ZnO-free grades of TiO_2.

Application properties

The influence of TiO_2 pigments on the application properties of emulsion paint is very important, not least of which are the rheological properties. It can be argued that rheology is controlled by other ingredients of paint formulation too, which is quite correct. However, the practical situation more often, is that the paint manufacturer is looking for an acceptable alternative, in this case an alternative grade of TiO_2, to be used as a direct replacement in an existing formulation, rather than a reformulation to identical rheological properties often at the risk of changes in some other essential property not immediately detectable but potentially troublesome later on. Interesting observations from practice indicate that analytically indentical pigment grades from group 5 can either improve or impair the flow of emulsion paint on a substrate. The flow improving grades are obviously suitable for roller coating applications on horizontal panel surfaces, as in the production of prefabricated ceiling and wall boards. The flow impairing grades allow the professional and do-it-yourself painter to apply a heavier, improved covering finish on a surface, often just in one application. Both grades have their own fields of application where they excel, but using them interchangeably in formulations, specifically developed for one situation would lead to very disappointing results, particularly on vertical surfaces where an emulsion paint, with a very good flow, immediately gives an impression of an unsatisfactory finish against a paint with less flow. It must be emphasised here that a comparative test of these different pigment grades by normal horizontal drawdowns, does not necessarily reveal any difference in their quality; a practical test is always needed. Further, there may also be formulations in which these grades behave identically on vertical surfaces, other ingredients of the formulation determining the rheological behaviour of the paint.

The rheological effects of surface treatments with different TiO_2 pigments are very pronounced, and here lies one of the most important reasons for the fact that despite the earlier observations on opacity which tend to nullify the virtues of the medium and heavily coated TiO_2 pigments grades, they are and will continue to be used in a number of commercial emulsion paint formulations.

To match these formulations with normally coated TiO_2 pigment grades, which may be possible, is a very tedious job, and in all probability would increase the number of formulation ingredients unduly.

Drying, mud-cracking and dry film properties

Much has been said about the effects of TiO_2 pigments on the drying of paint films especially in connection with decorative oil and alkyd paints. However, in decorative emulsion paints very little is said of the differences between different TiO_2 pigment types or grades in this respect. Flocculation and flooding can occur during the drying phase but they are omitted here intentionally because so far, no correlation has been found between flocculation and flooding and the type or grade of TiO_2 used, these phenomena being very much dependant on the total formulation, rather than on the TiO_2 grade alone. The differences in the mud-cracking tendency in heavily pigmented emulsion paints, however, are pigment dependent, and ought to be taken into account when selecting the TiO_2 pigment grade for a critical formulation. Mud-cracking is of course a function of pigmentation and can appear with any TiO_2 grade when a sufficiently high pigmentation level is reached. This level is characteristic for each pigment grade and is illustrated in Figure 2. If for a pigment type from group 5 (heavily coated rutile grade), this level for instance is 54 per cent, it can be expected to be approximately 60 per cent for a grade from group 4, approximately 65 per cent for a grade from group 2 and 70 per cent for a grade from group 3. Here we come back to our earlier observation, comparisons ought to be made in a horizontal rather than a vertical direction. Normally the problems arise only after the emulsion paint is fully dried and ready to fulfil its final decorative and protective function. Differences in the whiteness existing between different TiO_2 pigment grades, when compared without the presence of other ingredients, are compensated in the final emulsion paint to a great extent by the colour effects of extenders. These effects can naturally be minimised by careful selection of an extender and for special purposes requiring extra high whiteness, the difference between different TiO_2 pigment grades can be successfully utilised. It is very important to remember that whiteness and tint reducing power (more popularly called tinting strength) do not go hand in hand, which means for example that an ultrawhite TiO_2 pigment grade may give dull tints in pastel shades, when compared against tints achieved by using a neutral white pigment grade possessing a high tint reducing power. In this regard two factors are important: 1. the particle size of the pigment, and 2. the final state of the pigment dispersion in the paint film. A larger particle size yields a more yellow undertone and a smaller one, a more blue undertone, the latter giving the impression of a brighter tint. A more complete pigment distribution and division of agglomerates of the particles in the final state of dispersion, compensates for the effect of the colour pigments and enhances the impression of brightness (in a way this is also an effect of particle size). For good commercial quality rutile TiO_2 pigments, the tint reducing power may vary from grade to grade as much as 1700 to 1900 expressed in Reynolds numbers, and the average particle size from 190 to 260 nanometers. This explains the often pronounced colour changes in tints when replacing one TiO_2 grade for another in the white tint base. Thus it is necessary to draw attention to the effect of PVC change on the colour of tints. In this case the tint reducing power follows the opacity, and at the same TiO_2/colourant ratio the colour of the tint turns lighter and duller with increasing PVC as is nicely demonstrated by a series of drawdowns on tints of paint formulations in Table 2.

The influence of heavily coated TiO_2 pigment grades on film porosity has been mentioned earlier. At the same pigment loading, noticeable differences in the film porosity can be found between normally coated TiO_2 pigment grades. These differences cannot always be predicted on the basis of pigment analyses but must be tested, which can be done very reliably by the enamel holdout or by the Gilsonite Test. The effects of these differences in film porosity are reflected in the results of a wet scrubbability test, but it must be borne in mind that differences in the wet scrubbability test are also caused by differences in the methods used in the surface treatment of TiO_2 pigments even when no differences in film porosity exist.

Durability

The durability of a paint film is influenced to a great extent by the differences between TiO_2 pigment grades. Many of these influences are very difficult to correlate to the use of a particular grade, and misleading conclusions can easily be drawn where properties like adhesion, cracking, peeling, mechanical wear etc. are concerned. On the other hand very distinct differences between different grades can be found easily in the exterior durability expressed in terms of chalking, gloss retention and colour fade. Most often mentioned are chalking and gloss retention. In white paints however, the existing differences which are easily detected and expressed in solid numbers, may not in practice be as important to the decorative and protective value of the coating as they are often taken to be. In tints the situation is radically different as the colour fade caused by chalking leads to a drastic deterioriation of the decorative (but not necessarily the protective) value of the paint coat. Really serious defects appear when cracking and peeling destroy both the decorative and protective value of the coating, but the interdependence of these defects and TiO_2 pigment grade selection has not, so far, been satisfactorily investigated. Close investigation into the part played by the type and grade of TiO_2 pigment as a decisive factor in the development of these phenomena would be a challenging and worthwhile task for the future.

Gloss emulsion paints

Much what has been said already, applies to gloss emulsion paints. It is desirable, however, to treat this paint type as a separate item, because it has one easily measurable property, gloss which supersedes all others in importance.

As a concept "gloss emulsion paint" sounds quite straight-forward, but in practice production is full of complications. Eventually the fact may emerge that so far, all binders commercialised for this purpose, and/or the methods of manufacture of gloss emulsion paints, involve certain misconceptions, which if rooted out in the future might radically change the present ideas of the necessity of using a special type of TiO_2 pigment in their production.

Nevertheless the situation today is that the highest and most consistent gloss is achieved by using TiO_2 pigment grades from group 6, which are characterised by the practical absence of ZnO and SiO_2, being surface coated only with Al_2O_3. This type of pigment, micronised in the pigment production process to the ultimate prime particles, TiO_2 crystals, has been found to be outstanding in its ability to impart the highest achievable gloss to an emulsion paint film. Admittedly, in special cases pigment grades from the groups 2, 3 and even 4 can more or less match the gloss performance of a special grade, but recommending them throughout the line for any suggested emulsion formulation would be incorrect. For instance, a paint formulator, trying to find the best emulsion for a new emulsion paint formulation, might reject the best emulsion because of lack of gloss caused by the use of other than a special type of TiO_2 pigment in the comparative evaluation. Differences of a magnitude of even 30 to 40 units are possible in a 45° angle gloss measurement.

In the future, when gloss emulsion paint technology has reached a more mature stage, the differences between the special type and the types 2, 3 and 4 obviously will be reduced, and therefore it is always recommendable to test these types side by side with the special type in any new development. However the existence of the special type as a reliable standard should not be forgotten, and today its use is still considered a must for a producer of gloss emulsion paints, in order to be competitive.

Conclusions

The conclusions of this paper are that besides opacity, the differing characteristics of TiO_2 pigments cause differences in the following important paint properties: Dispersibility and achievable state of dispersion, viscosity, stability in storage, flow characteristics when applied, tint reducing power, whiteness and clarity of tints, film porosity (as measured by enamel holdout, Gilsonite Test and mechanical resistance for example wet scrubbability tests etc.) and exterior durability. Notable influences of TiO_2 pigment selection on the properties of gloss emulsion paints have been discussed as an individual item.

Next month's issue

The Honorary Editor has accepted the following papers for publication, and they are expected to appear in the October issue of the *Journal:*

A surface coating based on dehydrated castor oil. Part 1. physical and mechanical properties *by B. M. Badran, I. M. El-Anwar, M. S. Ibrahim and N. A. Ghanem*

The corrosion consultant at large *by J. E. Fowles-Smith*

Epoxy esters of rosin *by B. H. Hingorani, A. Uddin, H. Panda and Rakhshinda*

The application of acoustic emission to the study of paint failure *by T. A. Strivens*

reviews

Further information on any items mentioned below may be obtained by circling the appropriate *Reader Enquiry Service* number on the form at the back of the *Journal*. Enquiries will be forwarded to the Section concerned or may be forwarded to the lecturer.

Paint Formulation: Principles and Practice

J. Boxall & J. A. von Fraunhofer
George Godwin Ltd, London 1980,
pp. xii + 195 Price £10

It has been argued that, in theory, the essential ingredients for a paint are binder, pigment, solvent and drier. In practice, this is far from true. Formulating paints for various substrates and environments is a complex technology, and the authors should be congratulated for their courage in undertaking this venture.

The book is divided into seven main headings: basic paint technology, essential concepts of paint formulation, mathematics in paint formulation, and formulation of coatings for steelwork, timber, masonry and other substrates. To cover such topics in 190 pages has naturally resulted in some superficiality. Characterisation of substrates (a very important criterion for paint formulation), however, could have been covered more elaborately. In the authors' own words, the book "provides the basic information that enables the student to understand and tackle the complications of designing a satisfactory coating system", but readers must remember that following instructions from a good cookery book does not always produce the anticipated dish!

Reader Enquiry Service No. 22 D. DASGUPTA

An Infrared Spectroscopy Atlas for the Coatings Industry

The Infrared Spectroscopy Committee of the Chicago Society for Coatings Technology
Federation of Societies for Coatings Technology 1980
pp. xi + 869 Price US$100.00

For many years analysts in the paint industry have relied on the collections of the Federation of Societies for Coatings Technology and Hummel as the only major source of published reference spectra. New resins and raw materials for the industry are constantly being produced and both these collections have been augmented and revised at about the same time.

The Federation atlas has doubled in size since the last edition in 1969 and now includes 1,400 reference spectra of resins, oils, pigments, solvents and additives of all types used by the industry.

The compilers have obviously needed to rely on samples provided by industry and about half the spectra are of proprietary products with varying amounts of description of their chemical type.

It is interesting to speculate how much the sale of a particular component has been augmented as a result of appearing in a reference collection of spectra, merely because its spectrum was the nearest to that of a fraction isolated during the analysis of a product to be matched.

The present volume is rather weighty for laboratory use although its price is reasonable. One wonders whether, in another ten years time, larger volume(s) will be required or whether there will be a major switch to computerised matching from data banks of one form or another (a subject meriting only one paragraph in the present work).

The spectra reproduced are of good even quality, linear in wave number. There are clear introductory chapters on theory, instrumentation (including Fourier transform spectrophotometers), accessories, sample preparation, qualitative and quantitative analysis and applications, and a substantial bibliography. It hardly needs saying that this atlas is essential for anyone concerned with the infrared spectroscopic analysis of paints and related materials not in possession of an extensive in-house collection of spectra – in fact the value of any spectrophotometer would be diminished without it.

Reader Enquiry Service No. 21 L. A. O'NEILL

Industrial New Product Development

J. W. Carson & T. Rickards
Gower Press
pp. 158 Price £15

This book formalises a cost effective low risk method of new product development leading to incremental organisation growth, in the words of the Authors. The method, described as "Scimitar", is an acronym for Systematic Creativity and Integrative Modelling of Industrial Technology and Research.

It uses the three-dimensional block philosophy, Markets, Materials and Processes to explore the present boundaries of the Company Organisation, and thereby determine those areas in which expansion could take place. This combined with a market survey, indicates areas of need by industry which can be married into the three dimensional block.

New Product development is dealt with as a discrete activity, as is commercialisation, and the lines of division are made clear in order to avoid the overlapping of responsibilities.

It could be argued that there is nothing original in this book, and that it is a selection of well known techniques set down in chronological order which if adhered to will allow a Company to proceed from A to Z finishing up with a new product without having to use any corporate effort in doing so. However no method can succeed without the commitment of the Board and management, and this point is heavily stressed, as is the importance of correct staff selection for the New Product group.

This book has the added interest in that one of the Authors (J.C.) managed a New Product group and developed the organisation which is described therein.

It should prove a useful addition to the literature on new project management, if only to ensure logical thought and action.

Reader Enquiry Service No. 23 D. S. NEWTON

For information on membership of OCCA, enquiries should be sent to the Association's offices, see front cover for address.

occa meetings

London

Maintenance and Protection of North Sea Structures

A joint meeting was held with the London Branch of the Institute of Petroleum at the Institute's Headquarters, New Cavendish Street, W1 on 18 June 1980 when Mr M. Small, Products Manager, Berger Protection presented a lecture on "The Maintenance and Protection against Corrosion of North Sea Structures".

Among the 35 members of both societies were the President of OCCA, Dr F. Smith, and Director and Secretary of OCCA, Mr R. Hamblin and the Chairmen of both Societies.

In opening his lecture Mr Small described the sort of information which was available on off-shore structure protective coating systems, when the first oil rigs were being constructed for the North Sea. The experiences were restricted to shallow water and semi-tropical environments.

Off-shore structural steelwork was designed to have a life of 25 years and different parts of the structure needed different types of protection.

Totally submerged sections corroded relatively slowly as oxygen, necessary for corrosion, was not available in large quantities. High build pitch-epoxy coatings and sacrificial anodes were used to protect the structure.

The tidal or splash zone areas were the most difficult parts of the rig to protect. Correct surface preparation and paint application were critical factors in ensuring that the steel was fully protected. Up to 750μm thick films were being specified by oil companies in the splash zone. Epoxy or epoxy-pitch coatings were used.

Chlorinated rubber, vinyl and epoxy coatings were used on the deck and superstructure areas. Frequently composite systems of epoxy primer and vinyl or chlorinated rubber topcoats were employed to provide durability and re-coatability respectively.

Developments in topcoat technology were designed to combine the performance properties of epoxy and vinyl resin systems. Acrylic/urethanes were looking promising in this respect. Lower temperature curing polyamides were also being developed to allow for their use in low ambient temperature conditions.

Mr Small then went on to detail the reasons for coating failure in use. These include mechanical damage, poor surface preparation and poor paint application. Mr Small stressed the importance of the latter two aspects and described a wet blasting technique of sand/water/air at low pressure which was very effective in removing salts from the steel surface. A primer was available which could be used on the wet blasted surface which would displace residual water from the surface and provide protection to the steel before overcoating.

Mr Small finally provided details of typical specifications for coating systems and stressed once again the need for correct surface preparation if full protection was to be obtained from the coating system.

A vote of thanks to the speaker was proposed by Dr F. Smith and warmly echoed by the audience.

A.J.N.

Further information on any items mentioned below may be obtained by circling the appropriate *Reader Enquiry Service* number on the form at the back of the *Journal*. Enquiries will be forwarded to the organisation concerned.

news

Laporte TiO_2/Bio-Kil

Laporte Industries Limited has begun discussions with employees at Stallingborough with a view to rationalising production of titanium dioxide. This action, says the company, is necessary to improve productivity and profitability in the current hostile environment of high value sterling, high interest rates and the high cost of inflation.

The board of Laporte Industries (Holdings) Ltd and Bio-Kil Chemicals Limited have agreed on the terms of an offer by Laporte for the whole of the issued shares of Bio-Kil, to a total value of £3.75m.
Reader Enquiry Service No. 34

Mistrons from CIL-Gould

CIL-Gould Limited, the Manchester based manufacturers of organic pigments are to take over the United Kingdom distribution of all products from the Cyprus Industrial Minerals Corporation. These include the Mistron range of magnesium silicates and the recently introduced Cyprufil and Cyprusperse magnesium aluminium silicates.
Reader Enquiry Service No. 33

Training complex

Inmont opened a new 4,000 sq. ft. custom built training centre on 15 July 1980, it incorporates a lecture room, full sized spray booth and paint mixing laboratory, representing an investment of £250,000.
Reader Enquiry Service No. 57

Creativity in organic chemistry

The Editorial Board and the publishers of Tetrahedron Publications have decided to honour the memory of its founding Co-Chairmen, Sir Robert Robinson and Professor R. B. Woodward, by the creation of a Tetrahedron Prize. This prize will be given biannually for "creativity in organic chemistry". It will consist of an appropriate gold medal and the sum of US$10,000.
Reader Enquiry Service No. 31

Hodge Clemco/DeVilbiss

Hodge Clemco have concluded a non-exclusive agreement, to act as national distributors for the established range of DeVilbiss conventional spray painting equipment.
Reader Enquiry Service No. 32

news

Trade effluent problems?

A new system of treating trade effluent is now available from Colloid Peipho Ltd, a Merseyside subsidiary of the American Colloid Company.

Applications of the new system cover the removal of solvents, dye-stuffs, latex and other organic pollutants, emulsified mineral and vegetable oils, and a range of other pollutants.
Reader Enquiry Service No. 36

Coating inspectors

A national approval scheme for coating inspectors has been launched by the Institution of Corrosion Science and Technology, with a view to creating a nation-wide official register of approved and qualified inspectors. The aim is to ensure that professional standards are established, supervised and maintained.
Reader Enquiry Service No. 55

ICI appoint UK distributor

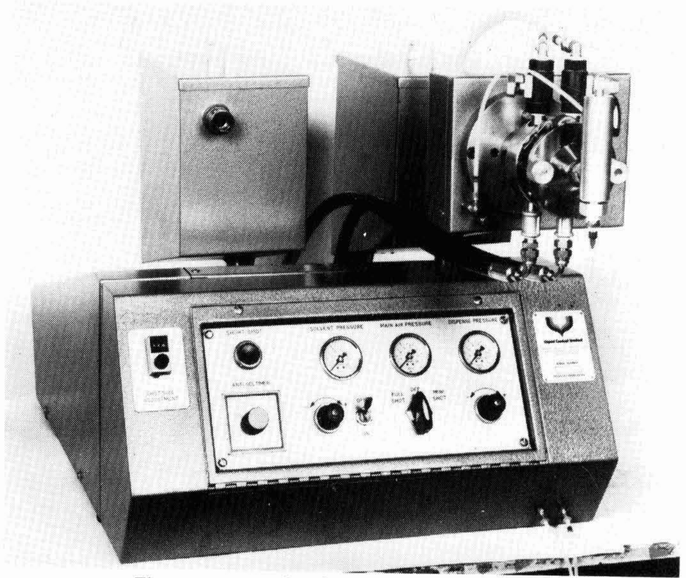
ICI (Mond Division) has appointed Ellis & Everard (Chemicals) as sole UK distributor, for small lots orders from 1st July 1980, of both "Alloprene" chlorinated rubber, used in the manufacture of specialised industrial and marine paints, adhesives, inks and road line paints and "Cereclor" chlorinated paraffins used in the oil, paint, rubber and plastics industries.
Reader Enquiry Service No. 35

new products

Multi-stage toothed ring mill

Glen Creston have introduced into the UK market a new type of extremely powerful wet size-reduction machine known as "Trigonal Machines". Capable of accepting fist or brick size feedstock they reduce these lumps to any desired size, in some cases down to a few microns.

The multi-stage size reduction operation of these colloid or toothed ring mills enables the Trigonal Machines to cope with tough, fibrous materials with almost as much ease as rapidly milled materials such as pigments, resins, agrochemicals etc.
Reader Enquiry Service No. 41



The new compact bench mountable Twinflow CVR

New mixing, metering and dispensing machine

A new compact and bench mountable automatic mixing, metering and dispensing machine has been developed by Liquid Control Ltd of Wellingborough. Designated the Twinflow CVR it has been specially designed as a simple, cost-effective and fully enclosed system for the smaller user of two component materials such as adhesives, encapsulants, sealants and other resins in a variety of industries.

The Twinflow CVR differs from existing Twinflow dispensing machines in that it is both more compact and also less expensive. Whereas the standard Twinflow needs 1 sq. m of flow area and costs in the order of £6,000, the Twinflow CVR weighs just 50 kg, occupies only a small bench area, and costs under £4,000.

With greater public concern being expressed in many quarters over the health and safety of processing plastics - particularly isocyanate based systems - many users are now looking at methods of automating their production lines.
Reader Enquiry Service No. 43

The Airmix AR Automatic

Kremlin Spray Painting Equipment Ltd of Slough have introduced another variant of their unique Airmix spraying system. This is a fully automatic spray gun, designated the Airmix AR Automatic.

The Airmix AR Automatic incorporates a feature of the Airmix MR hand spray gun in that it includes a variable fan width control when using the BX8 air cap.
Reader Enquiry Service No. 42

New pigments

CIL-Gould Limited, have added two more pigments to their extensive range.

Cilcalite Pyrazolone Orange F (Orange 34), a very strong transparent orange pigment suitable for all types of inks, plastics, rubbers and paints.

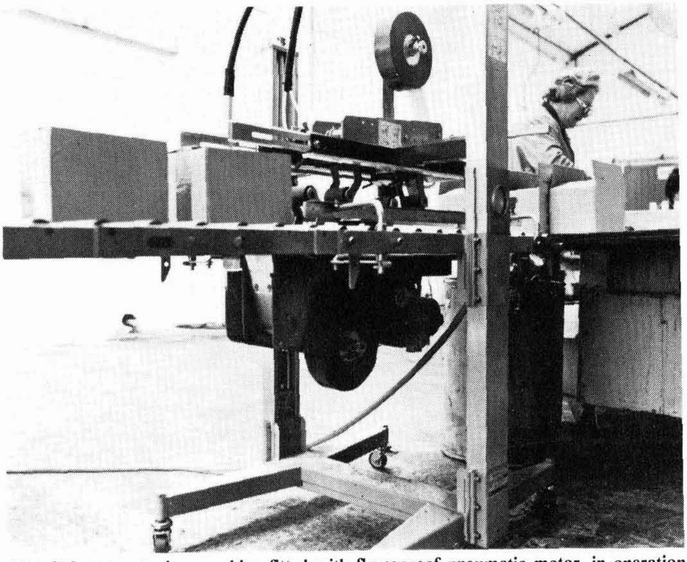
Cilcalite Yellows K/KR (Yellow 83), transparent diarylide yellow pigments with higher fastness properties than normal, making them ideal for many applications including oil and liquid printing inks, paints and plastics. Both products are tinctorally very strong and very transparent and hence find use in inks and other coatings for use on aluminium foil.
Reader Enquiry Service No. 39

Expanded Perlite

Silvaperl have launched a new range of graded expanded perlite under the brand name "Silvalite". It is an ultra-lightweight expanded mineral aggregate suitable for the particular requirements of modern textured paints, coatings and adhesives.
Reader Enquiry Service No. 46

Smoothcote Fungi-Chek

Silexine Paints Ltd, has developed a specialist exterior finish, incorporating the Dentolite System, called Smoothcote Fungi-Chek. The properties of Smoothcote, a smooth-finish masonry coating formulated to provide maximum exterior durability adhesion and weather resistance with minimal dirt retention, are combined with those of the Dentolite system giving resistance to severe lichen, mould, fungi and algae attack.
Reader Enquiry Service No. 56



The 3M carton taping machine fitted with flameproof pneumatic motor, in operation

news

Drum handling

A new drum handling trolley has been introduced using an entirely new pick up and lifting method.

The new trolley, called the 'Drum Rover' has been developed by the Bristol engineering firm Swift-Act Tools Ltd. Using this trolley, the company claims, standard steel drums and open topped drums with locking rims of capacities up to 45 gallons can be lifted and moved manually without strain on the part of the operator.
Reader Enquiry Service No. 37

Flameproof carton taping

3M have produced a semi-automatic carton taping machine fitted with a pneumatic motor, designed specifically for use in areas where low-flash solvents and other chemicals are a health and safety hazard.

Designated the 1A, it can replace tape dispensers or hand staplers in the packaging of drums, tins, sachets, bottles, cartons and aerosol dispensers, operations which are both laborious and time consuming.
Reader Enquiry Service No. 48

Analytical reference particles

Bioscan can now offer a range of over 100 analytical reference particles including an assortment of spheres, fibres and irregularly shaped particles. The range covers sizes from 0.1 to 900 μm.

The particles and spheres are made of polystyrene, glass, asbestos, alumina, and a variety of other materials.
Reader Enquiry Service No. 44

New resin

Synthetic Resins Ltd of Speke have made available a new saturated acidic polyester resin. Called Uralac P 2980, it is capable of giving users significant savings in the energy required to achieve cure. In combination with epoxy resin it is recommended for the production of low temperature curing electrostatic spray powders and gives, the makers claim, a ten per cent reduction in curing schedules compared with existing products.
Reader Enquiry Service No. 47

The new Drum Rover

news

New midget has better spray patterns

Tofte & Jorgensen UK Ltd, of Surrey, manufacturers of tank cleaning machines for a wide range of process vessels, have streamlined the shape of their Midget cleaner.

The new rounded contours give an improved spray pattern as the water passes through the machine and "fans" out to cover the internal surfaces of the vessel.

This small machine measuring 90 mm x 35 mm and weighing only 280 grammes is particularly suited to cleaning kegs or barrels as it is small enough to pass through a 40 mm bung hole.
Reader Enquiry Service No. 38

New power supplies

Steatite Roederstein introduces a new range of power supplies for electrostatic spraying, the new compact range of high voltage power supplies, ancilliary components and adaptors can be fitted to conventional spraying equipment.
Reader Enquiry Service No. 40

literature

BSI zinc dust pigment

A BSI publication No. "BS 3982: 1980 (ISO 3549-1976) Zinc dust pigment", is now available from the British Standards Institution. This International Standard deals with zinc dust pigment for use in protective coatings.
Reader Enquiry Service No. 52

Offshore rust

'War at Sea' is the latest title of a Cover Story from AM&S Europe Ltd, which is concerned with the prevention of corrosion on ships and offshore platforms and coastal structures. All major protection alternatives for steel are described within its pages, including galvanising, sprayed zinc, zinc pigments and most anti-corrosive paint types.
Reader Enquiry Service No. 50

CVP

Cray Valley Products have made available their "Resin Guide to the Eighties" which illustrates the comprehensive range of surface coating resins produced by the company.
Reader Enquiry Service No. 53

Universal blast primers

Experts in both the public and private sectors believe that the universal use of blast primers, best applied at the rolling mill, would effect major savings in the cost of corrosion of structural steelwork. The multiplicity of blast primer types, developed for individual finishing systems, makes this desirable practice uneconomic and unlikely to be adopted. There is therefore need for one or two "universal" blast primers able to provide a satisfactory degree of initial (primer only) protection and compatibility with the full range of topcoats which can reasonably be applied to the weathered primers.

A research report published by the PRA describes the extent to which such rationalisation is possible from current commercial products.
Reader Enquiry Service No. 51

Anti corrosion

The first edition of "The Anti-Corrosion Glossary & Directory" is now available, published by Scientific Surveys Ltd. It provides up-to-date information on the current trends, developments and research taking place in this field.
Reader Enquiry Service No. 54

Instrument News from Perkin-Elmer

Perkin-Elmer's 1980 Instrument News is now available.

Instrument News Volume 30 No. 1 is a complete survey of the company's new and existing products.

All major analytical techniques are covered including infared, atomic, fluorescence and UV/Visible spectroscopy, liquid and gas chromatography and thermal analysis.
Reader Enquiry Service No. 49

meetings, etc.

Printing ink/Annual Lecture

Evelyn J. Pritchard will present the 1980 Annual Lecture of the Technical Training Board for the Printing Ink and Roller Making Industries "Printing Ink in a Changing Environment", on Monday 27 October 1980 at 6.15 p.m. Further information from The Director, The Society of British Printing Ink Manufacturers Ltd, Alembic House, 93 Albert Embankment, London SE1 7TU

Coatings for bridges

The University of Missouri-Rolla, in co-operation with the Institute for Bridge Integrity and Safety, will present a one-day course on "Protective Coatings for the Maintenance of Bridges and Structures" on 23 October 1980 in St. Louis. Further information from Norma R. Fleming, conference co-ordinator, Arts and Sciences Continuing Education, University of Missouri-Rolla, Rolla, Mo. 65401.

Energy saving

"Energy Saving in the Surface Coatings Industry" is the title of a symposium being held by the Borough Surface Coatings Association on 14 October 1980 at the Polytechnic of the South Bank. Further information from P. J. Barnes, Department of Physical Sciences and Technology, Polytechnic of the South Bank, Borough Road, London SE1 0AA.

Gravure 80

An international conference on the market trends and technical developments in gravure 27-28 November 1980. Further information from the Booking Officer, Information and Training Division, Pira, Randalls Road, Leatherhead, Surrey KT22 7RU

appointments

Howard Jerome, of Spatz/Vane-Calvert, St. Louis, MO, has been nominated to be President-Elect of the Federation of Societies for Coatings Technology.

Cyril Williams

Mr Cyril Williams has been appointed Product Manager for Warwick Chemical Ltd for sales of their resins to the UK paint and allied industries.

Mr Gordon Gilbank has been appointed Managing Director of SSP Pumps Limited, of Eastbourne, part of the Mono Group of Companies. He takes over from Mr Reg Lee, founder of the company who is retiring.

Mr George C. Hodgson has been elected chairman of the British Aerosol Manufacturers' Association in succession to Mr Richard Knollys.

Further information on any items below may be obtained by circling the appropriate *Reader Enquiry Service* number on the form at the back of the *Journal.*

occa news

The photograph shows Mr F. B. Adeferati receiving the Chairman's Insignia from the first Chairman of the Nigerian Branch, Mr David Morris, who is wearing an Association lapel badge denoting that he is a Past Chairman of the West Riding Section

The photograph shows members of the Nigerian Branch Committee and other members taken at a recent Technical Meeting

Mr R. E. G. Johnson, Chairman of the Zimbabwe Branch wearing the Chairman's Insignia of Office

General Overseas Section

Insignias of Office have recently been sent to the two Branches of the General Overseas Section in Nigeria and Zimbabwe and the photographs show the Chairmen of the Branches wearing their insignia for the first time.

Those who are interested in joining the two Branches should contact the Hon. Secretaries of the Branches whose addresses are given below. It is understood that Meetings are being held regularly in the two Branches and that new Members will of course be welcome.

The addresses of the Hon. Secretaries of the two Branches are:

Mr N. K. Apatira, Berger Paints Nigeria Ltd., P.M.B. 21052, Ikeja Industrial Estate, Lagos, Nigeria.

Mr L. V. Diedricks, Box St. 697, Salisbury, Zimbabwe.

London Section

1980 Golf Tournament

The 1980 OCCA National Golf Tournament was organised by the London Section and held at Canons Brook Golf Club, Harlow, Essex on 11 June 1980.

After the disappointment of last year when the 1979 Tournament had to be cancelled due to lack of support, it was feared that a similar fate was in store for the 1980 Tournament despite earlier and wider publicity. However, it was decided to proceed with only 11 entrants, only two of whom were from ouside the London Area, and all those who took part agreed that it was a very enjoyable afternoon, even the non-players, the Chairman and Vice-Chairman of the London Section. Who could forget David Sharp's drive at the 4th or Jack Stewart's chip from off the green into the hole at the 13th. It was a long course, par 73, made even longer by the curious zig-zag path between tee and hole adopted by most players.

The cup was won by Mr Jim Jackson from the Manchester Section who will be hosts for the 1981 Tournament. The best score was by Dr Jack Stewart a non-member of OCCA. With 28 prizes to be distributed, nobody went away empty handed. After all, a score of 12 on the 1st hole, deserved some sort of recognition.

A very enjoyable dinner followed in the evening before a final session on the fruit machines proved less successful than the golf, and as members of the London Section left for home mutterings were heard in favour of holding a London Section Tournament next year.

B.F.G.

occa news

OCCA-33 Exhibition

28-30 April 1981

Cunard International Hotel
Hammersmith, London W6

Motif designed by Robert Hamblin

THE INTERNATIONAL FORUM FOR THE SURFACE COATINGS INDUSTRIES

General information

Following the success of OCCA-32 the Exhibition Committee of the Oil and Colour Chemists' Association is pleased to announce the arrangements for the 33rd Annual Exhibition which will be held from the 28-30 April 1981 at the Cunard International Hotel, Hammersmith, London W6.

Exhibitors and visitors to OCCA-32 found that the Cunard International Hotel offered Exhibitors a wide choice of types of exhibiting facilities, as well as the services to both exhibitors and visitors which a first-class hotel can supply.

The main part of the Exhibition will, once again be in two sections. The entrance to the Exhibition will be on the ground floor in the new Exhibition Hall, in which exhibitors of heavy machinery, plant and equipment or those wishing to have the traditional style of stand will be situated. **For OCCA-33 it is intended to arrange for a licensed bar to be available in the New Hall.**

On the first floor, additional exhibitors, mainly of raw materials, laboratory equipment or other small exhibits, will be accommodated in the Queen Mary Suite, in which the stands will be of a modular design. The Queen Mary suite is a large pleasant room which is decorated and carpeted as an integral part of the hotel.

Access between the two Exhibition areas will be through the intermediate Mezzanine floor, on which a small number of rooms will be available for exhibitors to display free standing exhibits.

In addition, several suites and rooms will be available for those companies who wish to use that type of facility to exhibit, or to entertain their visitors in addition to their stands in the main halls.

The Cunard International Hotel is able to offer both exhibitors and visitors to the Exhibition a selection of restaurants, a coffee shop, bars, shopping facilities and other services available in most hotels.

Theme for the Exhibition

The aim of the Exhibition is the presentation of commercial and technical information relating to raw materials, plant and equipment used in the paint, polymer, printing ink, colour, adhesive and allied industries, both in their manufacture, processing and application.

The Cunard International Hotel, Hammersmith, London, venue for OCCA 33, 28-30 April 1981

occa news

A display from one of the rooms on the Mezzanine Floor connecting the Queen Mary Suite with the New Exhibition Hall

Over 16 per cent of visitors completing cards came from overseas and an analysis of cards (both from the UK and overseas) by job function confirmed that the OCCA Exhibition has not only a wide appeal but is also able to attract the top level of the industries, as follows:

Description	*Percentage*
Director/Owner	13.86
Management	18.96
Section Head Group Leader	4.27
Chemist/Physicist/ Technologist	20.45
Lab Assistant/ Technician	7.88
Sales & Marketing	16.38
Buyers	3.13
Administration/ Secretarial	4.10
Lecturer/Student	0.81
Other	3.82
Cards not completed	6.34

The Exhibition Committee will be particularly pleased to welcome exhibits from companies relating to the new energy efficient, low-polluting technologies, including powder coatings, high solids coatings, radiation curing, water-based coatings and other developments.

International forum

An analysis of the registration cards completed at the entrance to the New Hall for OCCA-32 showed that visitors to the Exhibition were drawn from the following countries.

Australia, Austria, Argentina, Belgium, Canada, Chile, Cyprus, Denmark, Ecuador, Eire, Fiji, Finland, France, East and West Germany, Greece, Hong Kong, Hungary, India, Iran, Iraq, Italy, Japan, Jordan, Malaysia, Netherlands, New Zealand, Norway, Poland, Portugal, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Turkey, USA and Venezuela.

The OCCA Information Centre at OCCA 32 in the New Exhibition Hall

A view of the New Hall showing the great interest and activity generated

Dates and times

The thirty-third annual OCCA Exhibition, which will be a three-day event, will be open as follows:

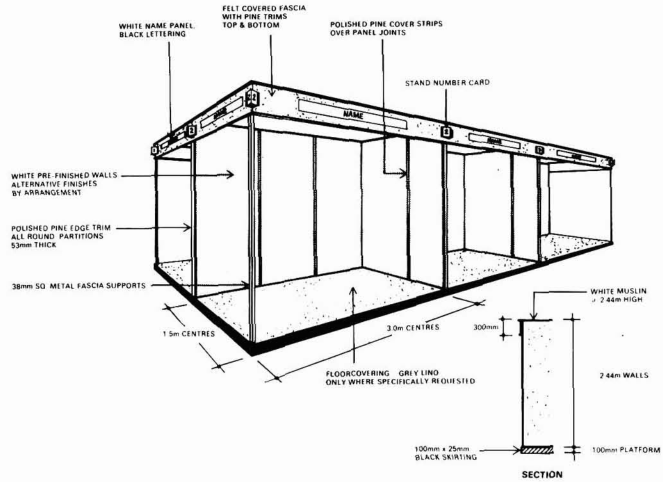
Tuesday 28 April 1981 . . 09.30 to 17.30
Wednesday 29 April 1981 09.30 to 17.30
Thursday 30 April 1981 . . 09.30 to 17.30

Travel facilities

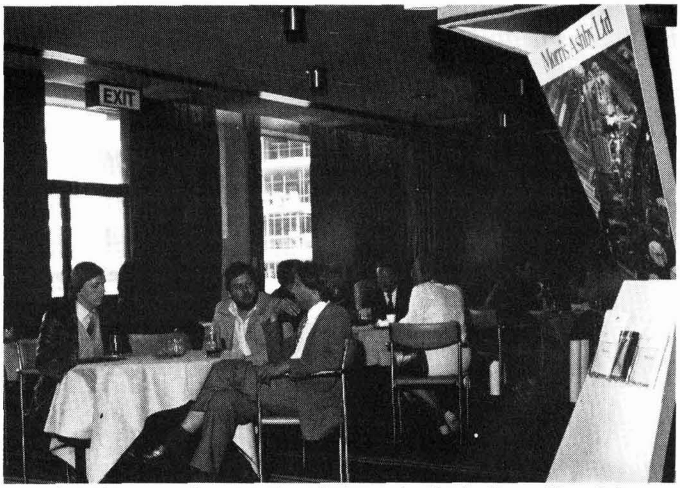
The Cunard International Hotel is situated near Hammersmith Station on

occa news

the Piccadilly Underground Line, between Heathrow Airport and the centre of London. Visitors from overseas may board the Piccadilly Line at Heathrow Central station in the Airport complex, which will take them direct to Hammersmith station or to central London where they may be staying. Car parking space at the hotel will be limited, but there is a large NCP car park close by in Kings Mall. However, those travelling to the Exhibition by car are advised to leave their vehicles outside central London and to travel to the Hotel by the Underground system.



The standard shell scheme in the New Exhibition Hall



A seating area adjacent to the refreshment bar in the Queen Mary Suite

Official Guide

It is intended, as in previous years, to publish the *Official Guide* to the Exhibition several weeks in advance so that it may be sent to visitors to enable them to plan the itinerary for their visits. The *Official Guide* will contain descriptions of the exhibits together with much other useful information for visitors, including maps of the exhibition areas, details of facilities, an analysis of exhibits, travel information etc. Advertising space in the *Official Guide* will be offered to those companies participating at the Exhibition. Advertising space in the 1981 *Official Guide* will not be restricted solely to those to whom space is allocated for the 33rd Annual Exhibition, and companies who will not be applying for stand space may well wish to secure advertising space in this important medium. Full details of the availability of advertising space, rates, special positions etc., may be obtained from the Assistant Editor at the address given below.

Invitations to Exhibit

Invitations to Exhibit, giving details of the various types of exhibition facilities which will be available at OCCA-33 were dispatched in July 1980 together with application forms, to those companies who have exhibited at previous OCCA Exhibitions or have requested information for OCCA-33. **The closing date for applications to exhibit at OCCA-33 will be 30 November 1980 but those organisations intending to exhibit are urged to submit their applications as quickly as possible.** Any organisation which has not previously shown at an OCCA Exhibition and would like to receive details should write to the **Director & Secretary, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF, England. Telephone: 01-908 1086, Telegrams: OCCA Wembley Telex: 922670 (OCCA G).**

A view of the Queen Mary Suite

John Roberts Manchester Section Winner of the Tony McWilliam Trophy, receiving the prize from Tony Jolly Manchester Section Chairman. Pannal Golf Course 27 June 1980

occa news

Manchester Section

Northern Sections proceedings

The inaugural event in the Northern Sections OCCA Golf Tournament organised by the Manchester, West Riding, Hull and Newcastle Sections took place on Friday 27 June 1980 at the Pannal Golf Club, Harrogate.

The Venue, chosen for its central location and excellent facilities, was the scene for 43 members and their guests to compete for various prizes and the Tony McWilliam Trophy, which was open to OCCA members only on a sectional basis. As you will recall Tony McWilliam was formerly secretary of the West Riding Section, Publications Officer then Chairman Manchester Section until his sudden death whilst in office, on 13 November 1978.

The Tournament was played as a singles stableford with a maximum stroke allowance of 18. Play commenced at about 1.30 p.m. and the players, in groups of 3, enjoyed varying golf but consistant fine weather. The results were as follows:

1. Tony McWilliam Trophy – A shield with 6 replica plaques – won by the Manchester Section Team of Messrs Roberts, Sinclair, Falder, Seymour, Dunn and Everett.
2. Highest Score – J. Roberts, Manchester Section 37 points.
3. Winning Guests – P. Bagshaw 32 points, G. Herrick 31 points.
4. Points Allocated Sectionally were: Manchester – 184, Newcastle – 161, W. Riding – 156 and Hull – 32.

An excellent evening meal was preceded by the presenting of prizes by Tony Jolly, Manchester Section Chairman. The Tournament was organised by N. Cochrane, W. Riding, H. Fuller, Newcastle, D. Robinson, Hull under the Chairmanship of a Manchester Section member whose anonymity is dictated by modesty. Our thanks to the above and those companies and individuals who donated prizes. The success of the day is reflected in the reservation of the course for next years event on Thursday 25 June 1981, details to be published in *JOCCA* next year.

F.B.W.

new members

The following elections to membership have been approved by Council. The Section to which each new Member is attached is given in italics.

Ordinary Members

ARCHER, ROBIN JEREMY, BSc, S.A. Tioxide (PTY) Ltd, P/Bag X504 Umbogintwini 4120, S. Africa. *(Natal)*

BAGNOLI, FRANCESCO, Via Zavaritt 94, Gorle/Bergamo, Italy. *(General Overseas)*

BEETHAM, ANTHONY STANLEY, BTech, 62 Byton Road, Tooting, London SW17. *(London)*

BOLLARD, MICHAEL GEORGE, MA, PO Box 2469, 34A Allen Avenue, Ikeja, Lagos, Nigeria. *(General Overseas)*

COPPLE, PHILIP, BSc, British Oxygen Chemicals Ltd., Vigo Lane, Chester-le-Street, Co. Durham. *(Newcastle)*

CROOKS, THOMAS A, Cabot Carbon of Canada Ltd, Suite 218, 45 Sheppard Avenue East, Willowdale, Ontario, M2N 5X1, Canada. *(Ontario)*

PHILBRICK, RICHARD HAMILTON, 283 Marine Drive, Brighton Beach, Durban 4052, S. Africa. *(Natal)*

HOPE, PAUL, BSc, CChem, MRIC, 43 Brooklands Drive, Goostrey, Crewe, Cheshire, CW4 8JD. *(Manchester)*

MCRONALD, GORDON ERIC, Fletcher Agriculture, PO Box 973, Dunedin, New Zealand. *(Wellington)*

RECZULSKI, HENRY JOHN, 90 Keewatin Street S, Oshawa, Ontario, L1H 6Z1, Canada. *(Ontario)*

SIMPSON, CLIVE ANTHONY, 36 Colombo Road, Ilford, Essex IGI 4RQ *(London)*

SMITH, DAVID VICTOR, BSc, CEng, MIMM, 127 New Dover Road, Canterbury, Kent CT1 3EG. *(London)*

SYKES, EMUND COLIN RICHARD, BA, MSc, Nairn Floors Ltd, PO Box 1, Kirkcaldy, Fife, Scotland. *(Scottish)*

new members

WOOD, STEPHEN PAUL, BSc, PAID Ltd, 6 Croydon Street, Domestic Street Industrial Estate, Holbeck, Leeds LS11 9RT. *(West Riding)*

Associate Members

BOCKHOP, ROLF, PO Box 31–118, Lower Hutt, New Zealand. *(Wellington)*

BRIDGE, GRAEME HASTINGS, 38 Ngatoto Street, Wellington 4, New Zealand. *(Wellington)*

GREENWOOD, GORDON MARTIN, Burrell Colours Ltd, Burrell House, 44 The Broadway, London E15. *(London)*

JAKUBEC, ANDREA MARIA, Berger Paints Pty. Ltd, Devon Road, Pinetown 3600, PO Box 664, S. Africa. *(Natal)*

MCGUINNESS, MICHAEL THOMAS, 93 Kings Crescent, Lower Hutt, New Zealand. *(Wellington)*

PHILLIPS, ALLAN, 52 Sander Road, New Germany, Pinetown 3600, Natal. *(Natal)*

POWNALL, ANDREW JOHN, 51 Lingard Road, Sutton Coldfield, West Midlands B75 7EA. *(Midlands)*

RUNDLE, KENNETH, c/o Bayer S.A. (Pty) Ltd, PO Box 3067, Port Elizabeth 6056, S. Africa. *(Cape)*

WILSON, CRAIG, School House, Sutton Girls School, Jockey Road, Sutton Coldfield B73 5PT. *(Midlands)*

Registered Students

BENTLEY, ADRIAN RONALD, 795 Aldridge Road, Great Barr, Birmingham B44 8NN. *(Midlands)*

BOOTH, STEVEN MARTIN, Crown Decorative Products Ltd, Hollins Road, Darwen, Lancs. *(Manchester)*

LEE, ADRIAN KIN KEUNG, c/o Undergraduate School of Colour, Chemistry & Colour Technology, University of Bradford, Bradford, W. Yorks. *(West Riding)*

PARSONS, WILLIAM JOSEPH, 9 Edmund Road, Alum Rock, Birmingham B8 1HB. *(Midlands)*

Jordan Award

This award was instituted by the late Mrs M. R. Jordan in memory of her husband Dr L. A. Jordan, who was President of the Association 1947-49 and an Honorary Member, and who died in December 1964. The Committee invites applications for the sixth award of £100.

The rules of the Award are:

1. The Award will be made for the best contribution to the science or technology of surface coating by a Member of any nationality working in either the academic or industrial field who is under the age of 35 at the date of application.

2. The final date for submission of applications will on this occasion be 31 December 1980 and it is hoped to present the award at the Bath conference in the following June.

3. The selection of the recipient of the Award will be made by a Committee under the chairmanship of the Association's Hon. Research and Development Officer.

4. There will be two methods of application. First, by the submission of a paper describing original work by the candidate which is offered for publication in the *Journal* or has been so published during application. The alternative method will be by recommendation by a superior for work which for reasons of commercial secrecy cannot be published; in this case the candidate will be expected to submit a dissertation on a topic relating to his work and demonstrating his superior knowledge of the principles thereof. The Award is for individual merit and clear evidence of the candidate's own contribution will be required if a paper is offered under joint authorship.

5. Applications should be addressed to the Director & Secretary at the Association's offices.

occa diary

Details are given of Association meetings in the United Kingdom and Ireland up to the end of the second month following publication.

September

Tuesday 2 September

West Riding Section: "West Riding Chairman's Lecture" by M.G. Bentley, at the Mansion Hotel, Roundhay Park, Leeds 8, commencing at 7.30 p.m. *Details to be announced.*

Wednesday 10 September

Manchester Section: Golf Tournament at Stockport Golf Club. *Details to be announced.*

Friday 19 September

Manchester Section: Student Seminar "Industrial Finishes - The Present and the Future," at the Manchester Polytechnic, New Administration Building, All Saints, commencing at 10.00 a.m.

Bristol Section: "The present state of water thinnable resins for the surface coatings industry" by G. Keith, Rohm & Hass (UK) Ltd (Joint meeting with the Birmingham Paint Varnish & Lacquer Club) to be held at the Royal Hotel, Bristol, commencing at 7.15 p.m.

Irish Section: "Safe Transport and Handling of Chemicals" by D. Fitzgerald, of ICI at the Clarence Hotel, Dublin, commencing at 8.00 p.m.

Thursday 25 September

London Section: "Vehicle Refinishing", by a speaker from Berger Paints, at the Princess Alice, Romford Road, Forest Gate, E7, commencing at 6.15 p.m. To be followed by a buffet supper.

Midlands Section: "Future Litho Plate Developments" by J. Ling of Coates Brothers Ltd, joint with Printing Institutes, at the Calthorpe Suite, County Cricket Ground, Edgbaston, Birmingham, commencing at 6.30 p.m.

Friday 26 September

Midlands Section: Ladies' Night Dinner Dance at the Botanical Gardens, Edgbaston. *Details to be announced.*

October

Thursday 2 October

Newcastle Section: "Maintenance and Protection against Corrosion of North Sea Structures", by F.M. Small, Berger, at the Students Common Room, St. Mary's College, Elvet Hill Road, Durham, commencing at 6.30 p.m.

Thames Valley Section: "Modern Coatings a curse or a blessing" by D. A. Bayliss of BIE (Anti-Corrosion) Ltd, at the Beaconsfield Crest Motel (White Hart), Aylesbury End, Beaconsfield, Bucks, commencing at 6.30 p.m. for 7.00 p.m.

Friday 3 October

Hull Section: Annual Dinner Dance to be held at the Willerby Manor Hotel, Willerby, Hull, details to be announced.

Monday 6 October

Hull Section: "Handling and Process Control in a Paint Factory" by H. Houben of TBMA Holland. Joint meeting with S. Humberside Chemical Engineers' Association to be held at the Humber Bridge Hotel, Bolton-on-Humberside, S. Humberside.

Tuesday 7 October

West Riding Section: "Chip Dispersions - Manufacture and Uses" by F. J. Morpeth of Foscolor Ltd, at the Mansion Hotel, Roundhay Park 8, commencing at 7.30 p.m.

Thursday 9 October

Scottish Section: "Searching for Oil in Alaska" by J. R. Taylor, BSc, FRIC, FTSC, at the Albany Hotel, Glasgow, commencing at 6.00 p.m.

Thursday 9 October

Midlands Section – Trent Valley Branch: "Iron Oxides and their production over the past 150 years" by S. N. Hawley of W. Hawley & Son Ltd, at the Derby Crest Motel, Pasture Hill, Littleover, Derby, commencing at 7.15 p.m.

Friday 10 October

Manchester Section: Lecture "Plastics for Buildings – 13 Years on" by B. Wade of Leeds Polytechnic, at the Manchester Polytechnic, New Administration Building, All Saints, commencing at 6.30 p.m.

Thursday 16 October

Midlands Section: "Powder Coatings" by L. Whitfield of BIP Ltd, at the Calthorpe Suite, County Cricket Ground, Edgbaston, Birmingham, commencing at 6.30 p.m.

Friday 17 October

Manchester Section: Annual Dinner Dance, at the Piccadilly Hotel, Manchester. *Details to be announced.*

Scottish Section – Eastern Branch: Annual Skittles Match, in the Carousel Inn, 145 Ferry Road, Edinburgh.

Thursday 23 October ·

London Section: "A lone-eyed view of the last half century of paint" by J. J. Froggatt, at the Rubens Hotel, Buckingham Palace Road, SW1, commencing at 7.00 p.m.

Friday 24 October

Irish Section: "Latest British Standards" by F. Timmins, sponsored by ICI Ireland Ltd, at the Clarence Hotel, Dublin, commencing at 8.00 p.m.

Friday 31 October

Bristol Section: Ladies' Evening, *details to be announced.*

Midlands Section - Trent Valley Branch: Halloween Buffet and Dance at the Cross Keys Inn, Turnditch. *Details to be announced.*

November

Monday 3 November

Hull Section: "Marketing in the Paint Industry" by L. F. McCulloch of Blundell-Permoglaze Ltd, at the Queens Hotel, George Street, Hull, commencing at 6.45 p.m.

Tuesday 4 November

West Riding Section: Lecture by a speaker from Shell Chemicals (UK) Ltd. *Details to be announced.*

Thursday 6 November

Thames Valley Section: "Application methods and in particular automatic systems" Lecture and films - DeVilbiss Co. Ltd, at the Beaconsfield Crest Motel (White Hart), Aylesbury End, Beaconsfield, Bucks, commencing at 6.30 p.m. for 7.00 p.m.

Newcastle Section: "Some training considerations for R & D". C. Murray, CAPITB, at the Students Common Room, St. Mary's College, Elvet Hill Road, Durham, commencing at 6.30 p.m.

Friday 7 November

Irish Section: Annual Dinner Dance, to be held at the Clarence Hotel, Dublin, commencing at 8.30 p.m.

London Section: Ladies' Night to be held at the Selsdon Park Hotel, Sanderstead, Surrey, commencing at 7.00 for 7.30 p.m.

Monday 10 November

Manchester Section: Lecture "Formulation of Lead Free Paints" by W. Kelch of BASF Ltd, Woodcourt Hotel, commencing at 6.30 p.m. *Details to be announced.*

occa diary

Tuesday 11 November

Midlands Section - Trent Valley Branch: "Recent technical developments in chlorinated rubber paints" by G. Humphreys of ICI, at the Derby Crest Motel, Pasture Hill, Littleover, Derby, commencing at 7.15 p.m.

Wednesday 12 November

London Section: "Plastics & Paints against Corrosion". A one-day joint symposium with the Plastics & Rubber Institute, at the Thames Polytechnic, Woolwich, SE18, commencing at 10.00 a.m.

Thursday 13 November

Scottish Section: Joint Lecture with the Society of Dyers and Colourists, Albany Hotel, Glasgow, at 7.30 p.m. "Effluent Problems" by W. G. Warwick, BSc, Project Engineering Manager, Ciba-Geigy P & A Company. "Toxicology" by J. Craig, Product Safety Executive, Ciba-Geigy Paints & Adhesives Company.

Wednesday 19 November

Manchester Section: Student Lecture "Pigment Packing and the Optimum Use of Extenders" by Manchem Ltd, at the Manchester Polytechnic, New Administration Building, All Saints, commencing at 4.30 p.m.

Scottish Section - Eastern Branch: "Organic Pigment Developments for the Printing Ink and Paint Industries" by Adrian Abel, of Hoechst (UK) Ltd, at the Murrayfield Hotel, 18 Corstorphine Road, Edinburgh, commencing at 7.30 p.m. It is hoped to arrange a light buffet at this function.

Thursday 20 November

Midlands Section: Student Lecture "General Corrosion Protection" by E. V. Carter of Miox Ltd, at the Calthorpe Suite, County Cricket Ground, Edgbaston, Birmingham, commencing at 6.30 p.m.

Friday 28 November

Bristol Section: "Pigments", D. Austin, Sun Chemical Corporation, *details to be announced.*

West Riding Section: West Riding Ladies' Evening Dinner and Dance to be held at the Crown Hotel, Harrogate.

OCCA CONFERENCE 1981

Alternative technologies in coatings

CALL FOR PAPERS

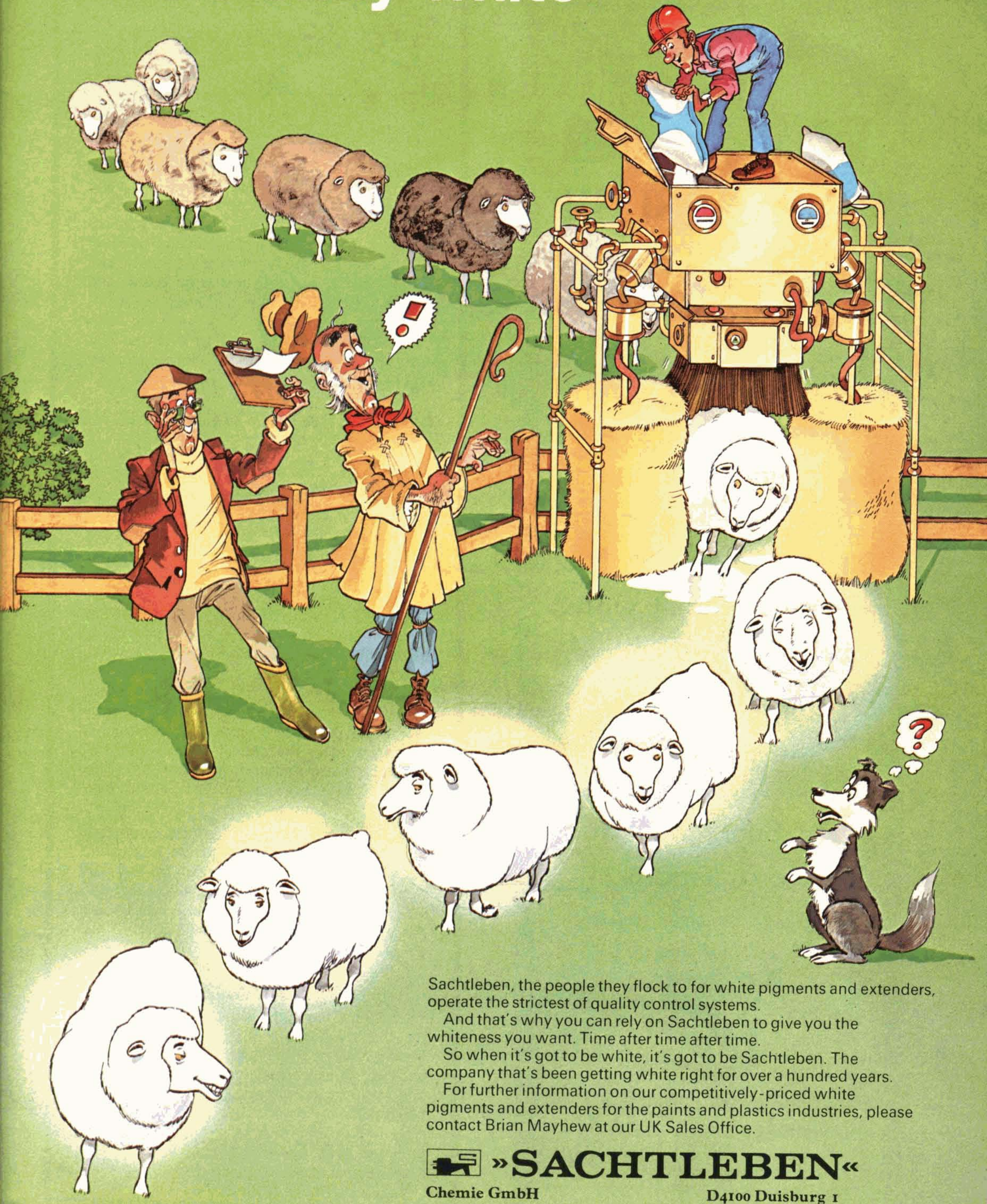
The next OCCA Biennial Conference will be held at the Beaufort Hotel, Bath from 17 – 20 June 1981 with the theme "Alternative technologies in coatings".

The future holds both opportunity and challenge for alternative technologies and topics covered by the Conference should include, EEC regulations covering the introduction of new chemicals, alternative means of obtaining opacity, the impact of microprocessors and computers on processing and application methods, high solids coatings, aqueous systems, radiation curing and powder coatings.

A departure from the usual conference format will be the inclusion of a "Discourse" session with the sub-title "Alternatives to coatings", where the use of techniques such as cathodic protection and substitution of coated items by plastics could be discussed.

The Hon. Research & Development Officer now invites offers of papers for presentation at this Conference. Anyone wishing to submit a paper for consideration should notify his intention as soon as possible to: **The Director & Secretary, Oil & Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF, England (Tel: 01-908 1086; Telex: 922670 OCCA G).**

Count on Sachtleben to be consistently white



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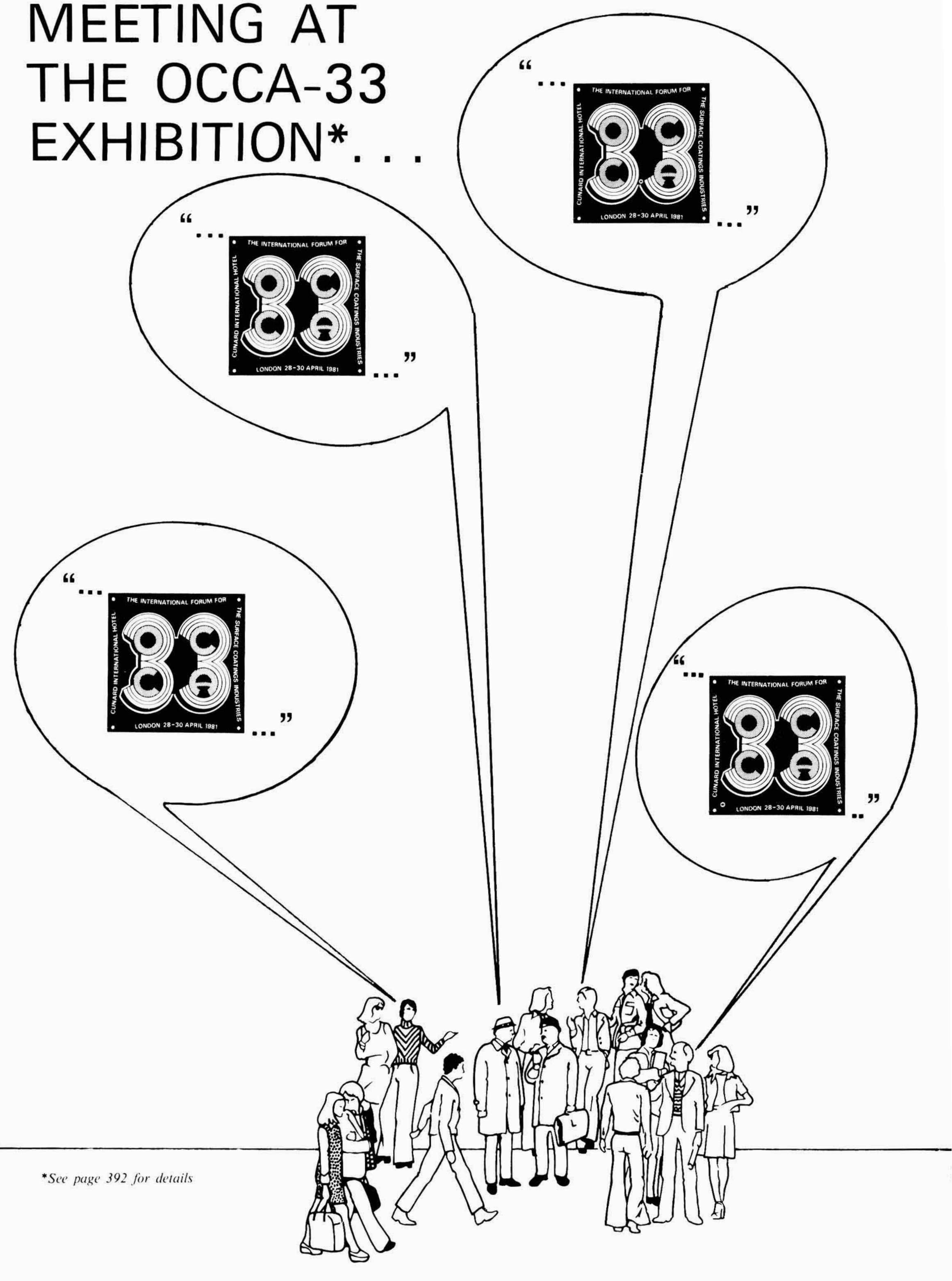
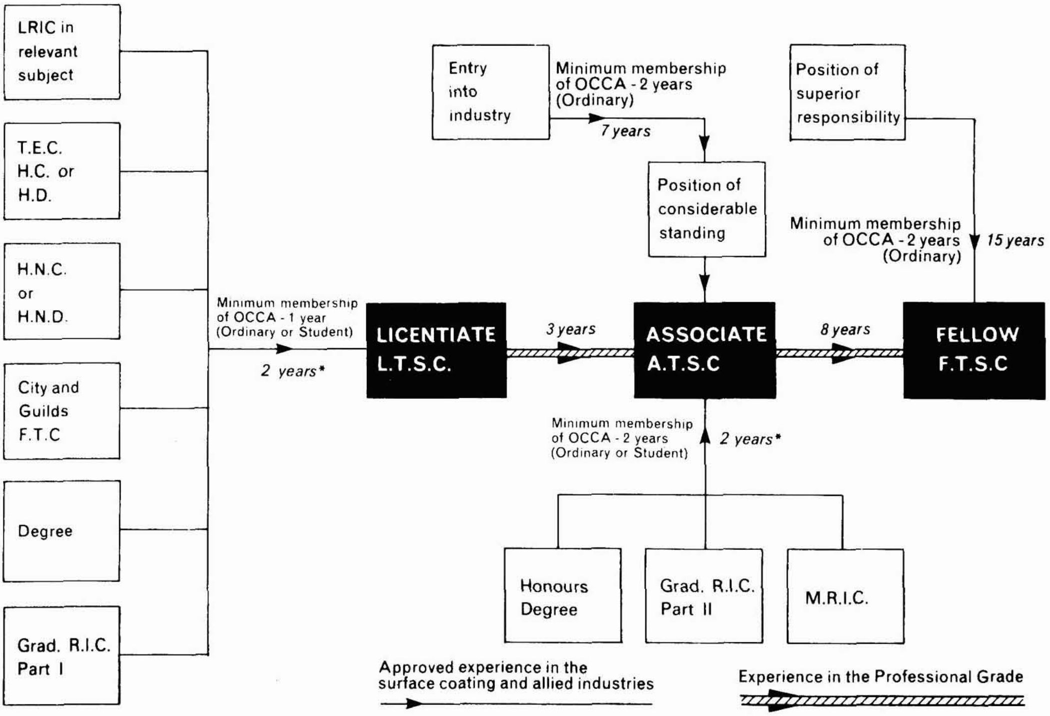


*See page 392 for details

Optional Professional Grade for Ordinary Members

The innovation of the Professional Grade has proved to be most successful, as evidenced by the impressive list of names in the December issue of the *Journal*. For the convenience of potential applicants, a chart indicating different routes to the various grades is shown below.

Routes to the Professional Grades



*Not necessarily after qualification – see regulations.
Note: At present there is no restriction on Students up to 21; between 21 and 25 a certificate from the employer or college confirming the course being taken is required.

Regulations for admission to the Professional Grade – Amended December 1979

Note: For the sake of simplicity, reference is made only to UK examinations etc., but equivalent qualifications overseas will naturally be accepted.

A. Licentiate

1. Shall be an Ordinary Member of the Association and have been an Ordinary Member or Student of the Association for not less than one year.

2. Shall have attained the age of 22.

3. (a) Shall be a Licentiate of the Royal Institute of Chemistry in Coatings Technology or another relevant subject, such as advanced analytical chemistry, colour chemistry or polymer science.

OR (b) Shall have passed the Higher Certificate or Higher Diploma of the Technician Education Council in coatings technology or other relevant subjects.

OR (c) Shall have passed Higher National Certificate or Higher National Diploma in a relevant subject.

OR (d) Shall hold the Full Technological Certificate of the City and Guilds of London Institute in a relevant subject.

OR (e) Shall be a graduate in a relevant subject.

OR (f) Shall have passed Part I of the examination for the Graduateship of the Royal Institute of Chemistry or Council of Physics.

OR (g) Shall have passed such other qualifications as approved by the professional Grade Committee from time to time.

4. Shall have attained approved experience in the science or technology of coatings. It is not expected that sufficient experience would be gained in a period of less than two years in the industry. Approved experience may be gained before, during or after the qualifications in paragraph (3) above have been attained.

5. Shall be required to satisfy the Professional Grade Committee, or some other body approved by the Professional Grade Committee in a *viva voce* examination and submit a dissertation on a topic previously approved by the Professional Grade Committee.

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either

Associate or Fellow) at least one of whom must be a Fellow.

7. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

B. Associate, being already a Licentiate

1. Shall, since his election to the Licentiateship, have practised the science or technology of coatings for not less than three years.

2. Shall provide evidence acceptable to the Professional Grade Committee of his superior professional skill and maturity.

3. Shall have published work which, in the opinion of the professional Grade Committee, is of a sufficiently high standard OR may be required to submit a thesis or dissertation on a topic previously approved by the professional Grade Committee OR shall hold the City & Guilds of London Institute Insignia Award.

4. MAY be required to satisfy the Professional Grade Committee or some other body as approved by the Professional Grade Committee in a *viva voce* examination.

5. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either Associate or Fellow) at least one of whom must be a Fellow.

6. Shall have paid the fee stipulated by Council and have paid the current subscription payable by an Ordinary Member.

C. Associate, not already a Licentiate

EITHER

1. Shall be not less than 24 years of age.

2. Shall be an Ordinary Member of the Association and have been an Ordinary member or Student of the Association for not less than two years.

3. Shall hold the Graduateship of the Royal Institute of Chemistry or Council of Physics or a University or Council of National Academic Awards degree recognised by the Royal Institute of Chemistry or Institute of Physics as giving full exemption from the Graduateship examination.

4. Shall have attained approved experience in the science or technology of coatings. It is not expected that sufficient experience would be gained in a period of less than two years in the industry. Approved experience may be gained before, during or after the qualifications in paragraph (3) above have been attained.

5. Shall normally be required to satisfy the Professional Grade Committee or some other body approved by the professional Grade Committee in a *viva voce* examination.

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either Associate or Fellow) at least one of whom must be a Fellow.

7. Shall have paid the fee stipulated by Council and have paid the current subscription payable by an Ordinary Member.

OR

8. Shall be not less than 30 years of age.

9. Shall be an Ordinary Member of the Association and have been an Ordinary Member of the Association for not less than two years.

10. Shall have been engaged in practising the science or technology of coatings for not less than seven years and shall have attained a position of considerable standing in the industry.

11. Shall normally be required to satisfy the Professional Grade Committee in *viva voce* examination of his professional competence.

12. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either Associate or Fellow) at least one of whom must be a Fellow.

13. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

D. Fellow

Note: This is the senior award of the professional grade and signifies that the holder has made outstanding contributions to the science or technology of coatings or has reached a position of eminence in the industry through the practice thereof. The Professional Grade Committee will require substantial evidence of professional maturity in the science or technology of coatings although commercial experience will be taken into account in assessing the merits of candidates.

1. Shall be not less than 33 years of age.

2. Shall have been an Ordinary member of the Association for not less than two years.

3. Shall be engaged in a position of superior responsibility in the coatings industry.

4. EITHER (a) shall have been an Associate of the professional grade for at least eight years;

   OR (b) shall have not less than fifteen years' experience of the science or technology of coatings in a position of superior responsibility.

5. Shall submit, with his application, an account of his experience, with due reference to scientific and technological interests, achievements and publications.

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade, all of whom must be Fellows.

7. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

The fees payable with applications are as follows:

Fellow–£10.00 Associate–£6.00
Licentiate–£3.00
(Plus VAT at standard rate)

Application

Completed application forms should be returned, together with the appropriate remittance, to the Director & Secretary at the Association's offices (except in the case of those Members attached to the Cape, Natal, Transvaal, Wellington, Auckland and Ontario Sections, who should address their forms to their Section Hon. Secretaries).

The Committee wishes it to be known that members rejoining the Association after a period in other industries may include length of service as an Ordinary Member before their resignation as part of the qualifying periods for entry into the Grade.

Students wishing to apply for entry into the Professional Grade must first make application in writing for upgrading to Ordinary Membership, giving the reasons for their eligibility for such regrading. Applications, together with the appropriate remittance, should be addressed as for application for admission to the Professional Grade.

Potential applicants are recommended to give the fullest possible details of their appointments, including the number and type of staff under their control, and indicating to whom the applicant is responsible, as this aids the committee considerably in its deliberations.

CLASSIFIED ADVERTISEMENTS

Classified Advertisements are charged at the rate of £5.00 per single column cm. Advertisements for Situations Wanted are charged at £1.50 per line. A box number is charged at £1.00. They should be sent to D. N. Buddles, Assistant Editor, Oil & Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF. JOCCA is published EVERY month and Classified Advertisements can be accepted up to at least the 12th, and in exceptional circumstances the 20th of the month preceding publication. Advertisers who wish to arrange for an extension of the copy deadline should contact the Assistant Editor, D. N. Buddles, at the address given above (telephone 01-908 1086, telex 922670 OCCA G).

SITUATIONS VACANT

OPPORTUNITIES IN PAINT

A major paint manufacturing company situated in the North of England has vacancies for:

DEPUTY CHIEF CHEMIST

. . . who will lead a small laboratory group involved in the initiation of new products for the decorative paint market.

Candidates should be of degree standard, experienced in decorative paint formulation, and with a flair for product development and the ability to supervise and motivate staff.

TECHNOLOGISTS

. . . with a sound level of education, together with a minimum of one year's experience in paint or allied technology.

The salaries offered for these posts will be in the range of £4,000 to £7,000 per annum, depending on qualifications and experience. Other employment benefits are those normally associated with a large progressive company. Assistance with relocation will be given in appropriate cases.

Please apply in the first instance giving full details of qualifications and experience to **Box Number 488.**

MARKET DEVELOPMENT EXECUTIVE – EUROPE

We have been retained to recruit a Paint Technologist to assist in the development of company sales to meet the increased demand in the UK and the rest of Europe.

Our client, Silberline Limited, is a fast-growing company engaged in the manufacture of aluminium pigments for the automotive industry.

The location is in Leven, at an attractive site in East Fife.

This challenging position offers an excellent opportunity for a young person having had some 4-6 years' experience in the Paint industry, with ambitions to enter the commercial field as part of a young, dynamic management team.

The successful candidate will possess the appropriate science degree or equivalent qualification. Knowledge of at least one foreign language would be an advantage.

The post will combine Technical Services and Product Development work in the plant with frequent customer-liaison visits throughout Europe.

A highly competitive salary will be paid and the post carries with it a company car and normal benefits in line with the position. Assistance will be given with relocation.

Applications in confidence with full career details to the company's adviser

Mr J. D. Fyfe
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Scoonie Road
Leven, Fife
Tel: (0333) 26761

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Taiwan, Republic of China
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MISCELLANEOUS

Back copies of JOCCA

May 1962 to date complete. Offers welcome, *please write to:* **Mr Speding, Technical Service Manager, Shand Kydd Ltd, Somerford, Christchurch, Dorset BH23 3QB**

Polymer Club, Mitcham – Symposium

The Polymer Club, Mitcham will be holding a one-day symposium on the "Treatment and Disposal of Waste Materials" on 1 October 1980 at the Mount Royal Hotel, Marble Arch. *Further details are available from:* **The Secretary, Mr H. A. Walpole, 63 Denmark Road, Carshalton, Surrey.**

SITUATIONS VACANT

MISCELLANEOUS

West Riding Section
Golf Trophy

Course: Knaresborough Golf Club, North Yorkshire.
Starting Time: 1.45 p.m. Thursday 2 October 1980
Stableford Singles: 7/8 Handicap max - 18 strokes allowed - Last 9 holes scores to be taken in the event of a tie.
Green fees will be £4.50 per round, paid direct to the Professional. In addition a charge will be made which will include evening meal, sweep, etc. Payment to be tendered on the day.
Members may invite a guest who will be eligible for the Visitor's Prize. *Further information from:*

Mr N. Cochrane
The Coach House
Red Holt
Hainworth Wood Road
Ingrow, Keighley,
W. Yorks. BD21 6BJ

JOCCA

READER ENQUIRY SERVICE – SEPTEMBER 1980

For further information please circle no more than three items:

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181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200

Please also send information on the following items relating to the above:

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Name . . . .

Job Title . . . .

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Send enquiries to:

Journal of the Oil and Colour Chemists' Association

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Telephone: 01-908 1086 Telex: 922670 (OCCA G)

AT ANY TIME DAY OR NIGHT

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See page vi for details of rates for Classified Advertisements.

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OIL & COLOUR CHEMISTS' ASSOCIATION

THE INTERNATIONAL FORUM FOR THE SURFACE COATINGS INDUSTRIES

CUNARD INTERNATIONAL HOTEL

OCCA 33

LONDON 28–30 APRIL 1981

ANNUAL EXHIBITION

28-30 APRIL 1981

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Telephone 01-908 1086 Telex 922670 (OCCA G)

We are interested in exhibiting at OCCA-33 (28-30 April, 1981, Cunard International Hotel, London). Please send us a copy of the Invitation to Exhibit.

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