Vol. 64 No. 7 JOCCAB 64(7) 249-280 (1981) July 1981

OCCA-33 EXHIBITION

Review Issue

See page 285

The photograph shows some of the stands in the New Hall

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Unfortunately publication of the paper by R. Stange, L. Klug and H. Klug scheduled to appear in July (see page 230 June issue) has had to be deferred as corrections were received too late for this issue.

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ABC

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Transactions and Communications

OIL AND COLOUR CHEMISTS' ASSOCIATION
Priory House, 967 Harrow Road, Wembley, Middlesex, HA0 2SF England

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Transactions and Communications

An experimental study of cavitation in real ink systems using temperature measurement techniques

By M. S. Ozogan and F. R. Young

Watford College, Watford, Hertfordshire, England

Summary

Ref. 1

Sudden changes in temperature were employed to detect the onset of cavitation in opaque printing ink systems. A further stage in cavitation which follows the onset and also causes a change in temperature was observed.

The variation in the drop in pressure (corresponding to cavitation onset) with nip gaps and different viscosity inks was determined by using the mathematical relationship derived by Banks and Mills[1]. The drop in pressure seems to decrease as the nip gap increases and also as ink viscosity becomes lower.

Various processes and additives were applied to the inks used in this study in order to determine whether cavitation can be controlled.

Keywords

Types and classes of coatings and allied products
printing ink

Raw materials for coatings
oils
mineral oil
surface active and rheological agents
gellant
wetting agent

Processes and methods primarily associated with application of coatings and allied products
cavitation

Properties characteristics and conditions primarily associated with materials in general
temperature
viscosity

Une étude expérimentale, au moyen des techniques de la mesure de température, sur l'arriveé de cavitation en encres d'imprimerie

Résumé

On a utilisé des brusques changements de température pour déceler le commencement de cavitation aux opaques encres d'imprimerie. Une autre étape de cavitation qui y succède et qui provoque d'ailleurs un changement de température a été notée. La variation, en fonction de l'écart des cylindres et des encres ayant de différentes viscosités, de la chute de température qui correspond au commencement de cavitation a été obtenue à partir de la formule mathématique de Banks et Mills. Il semble que la chute de température diminue à mesure que l'écart des cylindres augment et également que la viscosité de l'encre diminue. On a utilisé divers procédés et adjuvants afin de déterminer si la cavitation peut être contrôlée.

Ein experimentaler Versuch mittels Temperaturmessungsmethoden der in Druckfarbe vorkommenden Kavitation

Zusammenfassung

Plötzliche Temperaturänderungen wurden angewandt den Kavitationsanfang in undurchsichtigen Druckfarben zu entdecken. Eine nach dem Anfang vorkommende Kavitationsetappe wurde beobachtet die ebenfalls eine Temperaturänderung wirkt. Die dem Kavitationsanfang entsprechende Druckabfallschwankung wurde in Beziehung dem Walzenabstand und der verschiedenen Druckfarbenviskositäten (mittels der mathematischen Verhältnisses von Banks und Mills) erhalten. Es scheint dass je grösser der Walzenabstand und ebenfalls je niedriger die Viscosität um so kleiner wird der Druckabfall. Verschiedene Verfahren und Additive sind angewandt worden um zu bestimmen ob Druckfarbenkavitation kontrolliert werden könnte.

Introduction

Refs, 1-7

In many industrial coating processes a sheet of material emerges from a bath of fluid and then passes between cylindrical rollers which control the thickness of the film (e.g. ink, paint or protective coating) on each side. Cavitation on the divergent side of the nip is quite likely to occur in most situations. Gas release and collection in the divergent region may have a deleterious or beneficial effect upon the process.

The problem of cavitation between cylindrical rollers has received both theoretical and experimental attention. (Gatcombe[2], Hersey and Lowdenslager[3], Banks and Mill[1], Taylor[4], Markho[5], Coveney[6], Coveney and Young[7]).

It has been determined that cavitation occurs in the region where the drop in pressure is greatest. It is possible to observe the formation of cavitation bubbles when a transparent fluid is being used but in a printing application this is rarely the case since the fluids normally used are pigmented inks.

The drop in pressure is accompanied by a sudden change in temperature at the nip[6], and therefore it should be possible to determine the onset of cavitation in opaque systems.

In the work described here, temperature measurements were employed to detect the occurrence of cavitation between rollers. The aim was to extend cavitation detection to opaque fluids which is of practical interest to the printing industry.

Apparatus

Ref. 8

The apparatus used has been described in detail by King[8]. A schematic representation of the rig is shown in Figure 1. Basically it consisted of a perspex tank 200 mm in each direction, containing the working fluid and two perspex rollers mounted side by side in a vertical position inside the tank. The rollers were 50 mm in diameter and had an effective working length of 150 mm. One roller was fixed in position but the other could be moved by means of two screws with two dial gauges recording this movement. The nip gap was varied in this way.

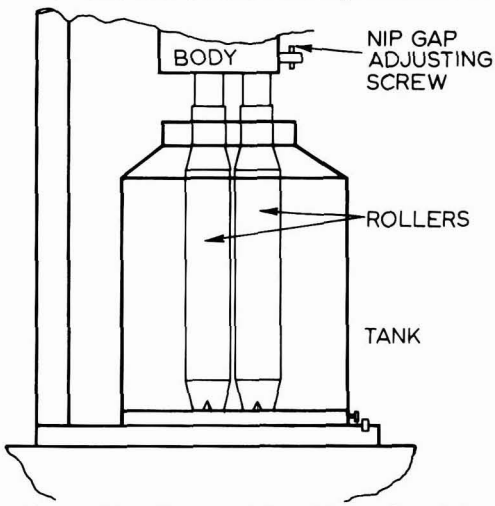

Figure 1. Schematic representation of the experimental rig

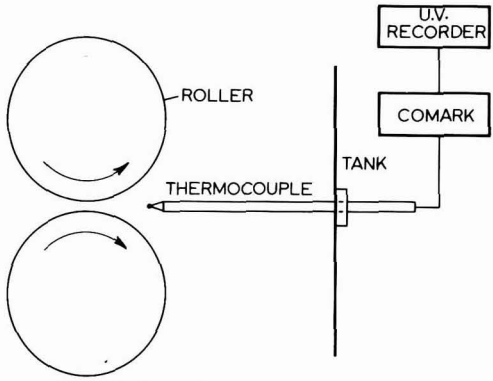

Figure 2. Temperature measurement arrangement

Speed measurement was by a Compton tachometer with a direct reading scale to which a short toothed belt, driven by the main driving shaft, was attached.

The temperature measurements were obtained by means of a temperature probe housing a thermocouple connected to a Comark electronic thermometer with a direct reading scale. The probe was positioned at the divergent side of the nip. Figure 2 shows the arrangement for temperature measurements.

Both speed and temperature signals were transmitted to an ultraviolet recorder.

The effects of adding a gelling agent and a wetting agent to a black rotary letterpress ink, and the effects of the degree of dispersion were examined. Table 1 provides the names and characteristics of these inks.

Results and discussion

Ref. 9

Typical ultraviolet recordings of temperature obtained during the tests are shown in Figure 3, (a) and (b). For all

Table 1
Viscosities of the inks used

No.	Type of ink	Viscosity (Nsm^{-2})
1	Rotary black letterpress ink	0.63 at 20°C
2	Rotary black letterpress ink (dispersed)	0.45 at 21.1°C
3	Low mist rotary black ink (Bentone gelling agent added)	0.69 at 20.3°C
4	Rotary black letterpress ink with wetting agent. (4% asphalt and mineral oil mixture added)	0.67 at 20.8°C
5	Rotary black letterpress ink with mineral oil (4%)	0.68 at 20.3°C

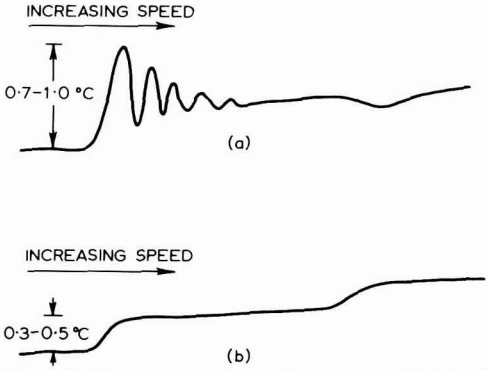

Figure 3. Ultraviolet recordings of temperature: (a) inks, (b) Hyvis 3 and ink-wetting agent mixture

the inks, with the exception of the ink with setting agent, the onset of cavitation was marked by a sudden increase in temperature followed by oscillatory behaviour which stabilised later. At a later stage in the recording another sudden change in temperature corresponding to another stage in cavitation was observed. This change differed from the first in having no oscillatory behaviour (Figure 3(a)).

In previous experiments conducted with a mineral oil (BP Hyvis 3), two stages in the cavitation were observed. Firstly, the occurrence of a row of bubbles in the nip region, and secondly, formation of air fingers and the start of clouds of travelling air bubbles. These were accompanied by sudden changes in temperature but no oscillation. This was also observed for the ink with wetting agent (Figure 3(b)). The similarity in thermal behaviour would suggest the same kind of situation occurring in opaque fluids as well.

The reasons for the oscillatory behaviour observed in printing inks are not entirely understood and require further investigation. In his review of acoustic cavitation, Neppiras[9] distinguished two types of cavitation called stable and transient cavitation. According to Neppiras: stable cavities are bubbles that oscillate often, non-linearly and may continue oscillating for many cycles of the acoustic pressure. On the other hand, transient cavities generally exist for less than one cycle.

This explanation would indicate a relationship between bubble motion and temperature.

The calculation of pressure drop

Ref. 1

Banks and Mill[1] predicted that the drop in pressure P_D,

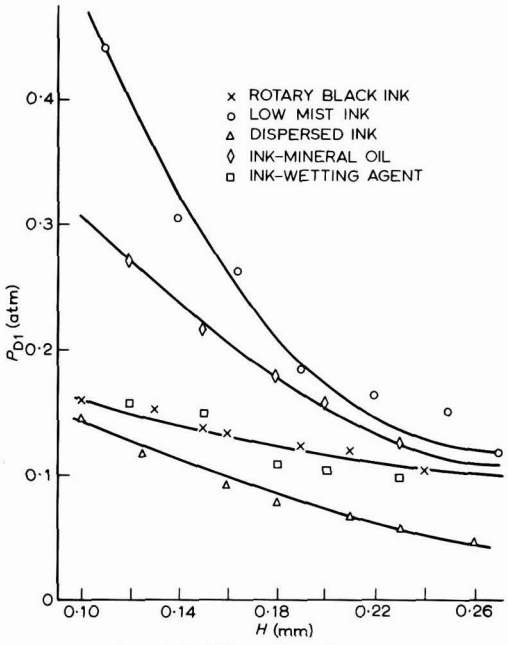

Figure 4. Variation of P_{D1} with nip gap

corresponding to the formation of cavitation is given by:

$$P_D = \frac{3\sqrt{3}\pi V \eta R^{3/2}}{2H^{3/2}}$$

Samples of drops in pressure (from atmospheric pressure) for the test inks, calculated by using the above equation are shown in Table 2. It is worth noting that the drops in pressure are not large enough to create negative pressures.

In Figure 4, the variation in the values of P_{D1} with nip gap for the inks used are presented. It is seen that for all the test inks there exists a unique characteristic showing that P_{D1} values go down as the nip gap increases. One other factor affecting P_{D1} was found to be the viscosity of the inks used. As the viscosity increased, P_{D1} increased as well.

The results for P_{D2} present a different picture as seen from Figure 5. Although the P_{D1} values for the two inks differ from each other considerably (Figure 4), there is not much difference between their respective P_{D2} values. It is seen that like P_{D1}, P_{D2} is also dependent upon nip gap.

Table 3 and Figure 6 show the results from a low mist

Table 2
Variation in drops in pressure with various types of inks and nip gaps

Ink	1		2		3		4		5	
Nip gap (mm)	0.10	0.21	0.10	0.21	0.11	0.22	0.12	0.23	0.12	0.23
P_{D1} (atm)	0.16	0.12	0.145	0.068	0.441	0.164	0.159	0.10	0.272	0.145
P_{D2} (atm)	0.641	0.202	0.551	0.170	0.695	0.269	0.505	0.216	0.604	0.258

Table 3
Variation in drops in pressure with nip gap (low mist rotary black ink)

Nip gap (mm)	0.11	0.14	0.165	0.19	0.22	0.25	0.27
P_{D1}	0.441	0.305	0.262	0.185	0.164	0.171	0.118
P_{D2}	0.695	0.441	0.424	0.323	0.269	0.212	0.187

Table 4
Variation in drops in pressure (atm) with nip gap (ink-wetting agent, ink-mineral oil)

Nip gap (mm)		0.12	0.15	0.18	0.20	0.23
Ink and wetting agent	P_{D1}	0.159	0.150	0.110	0.105	0.100
	P_{D2}	0.505	0.350	0.307	0.300	0.216
Ink and mineral oil	P_{D1}	0.272	0.216	0.176	0.161	0.145
	P_{D2}	0.604	0.453	0.363	0.333	0.258

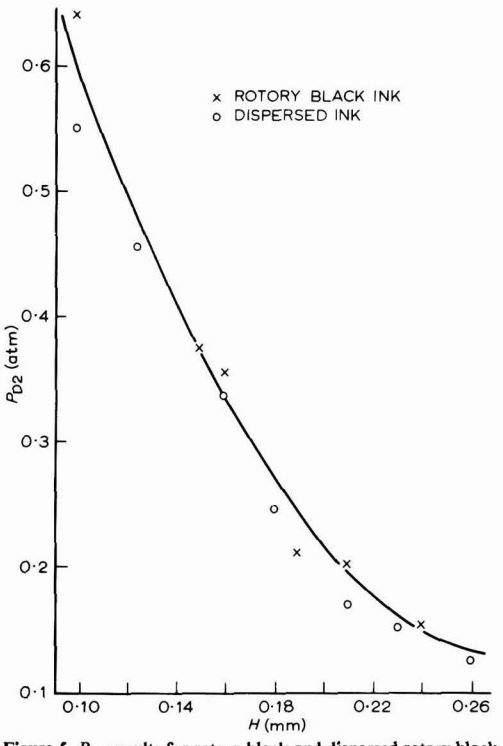

Figure 5. P_{D2} results for rotary black and dispersed rotary black inks

ink. It is interesting to note that the values for the stages of P_{D1} and P_{D2} are very close to each other. This is a characteristic not observed in the ordinary printing inks. It seems that the addition of a gelling agent brings the two stages closer.

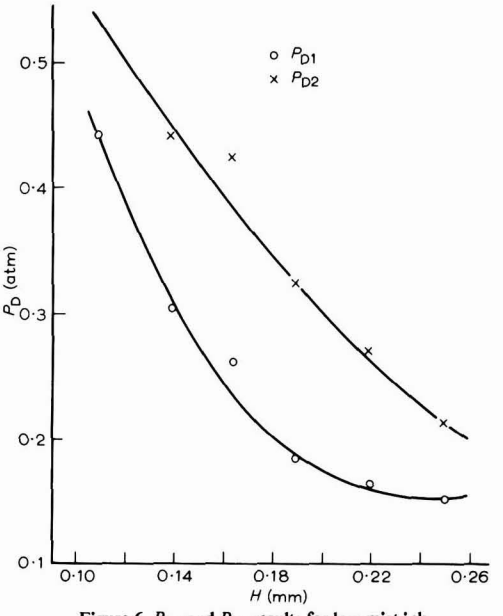

Figure 6. P_{D1} and P_{D2} results for low mist ink

Table 4 shows the results for inks with wetting agent and mineral oil. As observed in Figure 4, the drops in pressure corresponding to the onset of cavitation for the ink with wetting agent do not vary much from those of the ordinary printing ink. Whereas, for the ink with mineral oil, the P_{D1} values are relatively higher although the viscosities of these ink solutions are nearly the same.

Figure 7 presents a comparison of P_{D2} values from three inks, one with wetting agent, one with mineral oil and the third an ordinary printing ink. It is interesting to note that for nip gaps of up to 0.14–0.15 mm, the P_{D2} values for

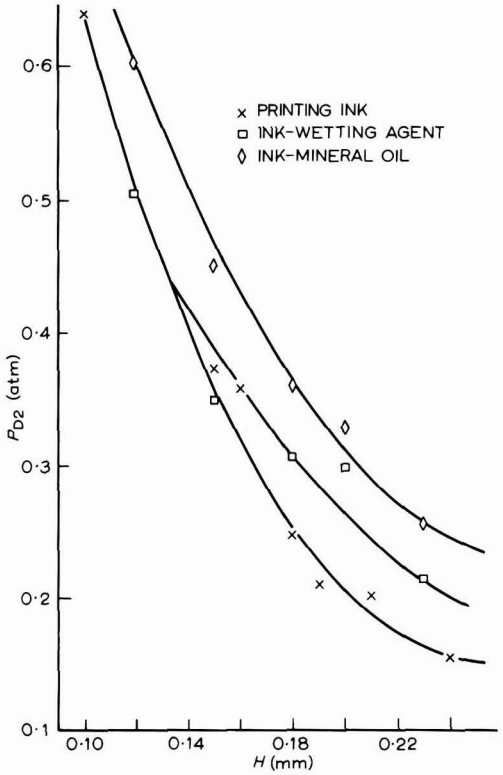

Figure 7. Comparison of P_{D2} values of rotary black ink with those of ink with wetting agent and ink with mineral oil

these three inks are very close. However, after 0.15 mm the values differ considerably.

Conclusions

Refs, 6,9,10

The results confirm that the occurrence of cavitation is accompanied by a sudden temperature change, confirming Coveney's observations[6].

It was observed that the temperature readings indicate the existence of a second stage in cavitation, in agreement with Neppiras[9,10].

Nip gap plays an important role in the amount of drop in pressure. It has been established that as nip gap increases, drop in pressure decreases. It has also been observed that the drops in pressure at the onset of cavitation move closer to each other with increasing nip gap.

The addition of low misting agents to the printing inks causes an increase in the drop in pressure and also brings the two stages of cavitation closer. On the other hand, the addition of wetting agents hardly effects the drop in pressure. The addition of mineral oil to the ink seems to increase the drops in pressure, particularly at the onset of cavitation.

Contrary to what is observed with mineral oil, the drops in pressure for inks are never large enough to cause negative pressures. The viscosity of ink is another factor affecting the drop in pressure.

The high viscosity inks seem to have larger drops in pressure corresponding to the onset of cavitation.

Acknowledgements

The work reported in this paper was supported by the Science Research Council. The authors are grateful to Croda Inks Division and Mr P. Harper for generous supplies of printing inks and additives, and to Mr V. Turner of Watford College for much helpful information and advice.

[*Received 19 December 1980*

Notation

H	nip gap (mm)
$P_{D1}P_{D2}$	drops in pressure corresponding to two stages of cavitation (atm)
R	radius of the roller (mm)
V	velocity of rollers (rps)
η	viscosity

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Crystal chemistry of molybdenum red and orange pigments

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Summary

Refs, 1-8

Samples of a molybdenum red and an orange pigment – collected at various stages of synthesis and ageing – and industrial pigments have been characterised by various methods (X-ray diffraction, IR, electron microscopy, micro-analysis).

The pseudo-tetragonal phase is represented by globular particles, while needlelike particles correspond to the lead chromate-like monoclinic phase; however, there is no significant difference in chemical composition between the two types of crystals. The pseudo-tetragonal phase is converted into the monoclinic phase under wet conditions through a dissolution-re-precipitation process. On the other hand the pseudo-tetragonal to monoclinic transformation can occur as a simple phase transition, provoked by grinding.

Keywords

Raw materials for coatings

prime pigments and dyes

molybdate orange
molybdate red

Properties charactistics and conditions primarily associated with

materials in general

crystalinity
particle size

Processes and methods primarily associated with

analysis measurement or testing

electron microscopy
infrared spectroscopy
X-ray spectroscopy

manufacturing or synthesis

grinding
precipitation

Cristallochimie des pigments rouge et orange de molybdène

Résumé

On a caractérisé par différentes méthodes (diffraction RX, spectroscopie I R, microscopie électronique, microanalyse) des échantillons d'un rouge et d'un orange de molybdène prélevés à différents stades de la synthèse et du vieillissement, ainsi que des échantillons industriels.

La phase pseudo-quadratique est représentée par des cristaux globulaires et les particules en forme de bâtonnets correspondent à la phase monoclinique analogue au chromate de plomb; cependant il n'y a pas de différence significative de composition chimique entre les deux types de cristaux. Un vieillissement sous humidité entraîne une conversion de la phase pseudo-quadratique en phase monoclinique, par un processus de dissolution et reprécipitation. D'autre part la transformation pseudo-quadratique → monoclinique peut se produire comme un simple changement de phase, provoqué par un broyage.

Die Kristallchemie der Molybdatrot- und Molybdatorangepigmenten

Zusammenfassung

Proben von einem Molybdatrot und sowie einem Molybdatorangepigment wurden zu verschiedenen Synthese- und Alterungsetappen genommen, die sowie industrielle Pigmente durch verschiedene Methoden charakterisiert worden sein, (Beugen von Röntgenstrahlen, Infrarotspektroskopie, Elektronenmikroskopie, Mikroanalyse).

Die Pseudotetragonalphase lässt sich von kügelformigen Teilchen darstellen, während nädelformige Teilchen der Monoklinphase entsprechen, und die ähnlich dem Bleichromat sind, obwohl es zwischen der Kristalltypen keinen chemischen Zusammensetzungsunterschied gibt. Die Pseudotetrogonalphase wird durch ein Auflösen- und Widerausflockungsverfahren unter feuchten Bedingungen zu der Monoklinphase konvertiert. Im Gegenteil kann die Pseudotetragonal/Monoklinumwandlung als eine durch Mahlung hervorrufende Phaseumwandlung vorkommen.

‡To whom correspondence should be addressed

Introduction

Refs, 1-8

The molybdenum red and orange pigments are solid solutions, the composition of which fall in the range 10-15 per cent $PbMoO_4$, 3-10 per cent $PbSO_4$, 75-90 per cent $PbCrO_4$.

The stable forms of lead sulfate, chromate and molybdate are respectively orthorhombic, monoclinic and tetragonal at room temperature[1-5]. The solid solution may give two different phases. One has a monoclinic cell which is a slightly distorted version of the tetragonal lead molybdate cell[6] and will be denoted pseudo-tetragonal phase; the molybdate ions thus impose the mode of crystallisation on lead chromate. The solid solution may also form monoclinic crystals giving X-ray diffraction patterns similar to pure lead chromate. The pseudo-tetragonal phase is not stable; if not properly stabilised it may recrystallise in monoclinic needlelike crystals[1-4,7,8].

The pigments can vary from light orange to deep red, the final hue depending not only on chemical composition but also on crystal structure and particle size, and is thus very sensitive to preparation conditions.

The aim of the present work is to investigate the crystal chemistry of these pigments by examination of both their crystalline form and morphology; in selected cases these are related to the chemical composition of individual crystals by microanalytical techniques.

Experimental methods

Transmission electron micrographs were obtained with an AEI EM6G electron microscope. Microanalysis of individual particles was performed with a JEOL JEM-100 CX electron microscope (model TEMSCAN), equipped with a KEVEX energy dispersive spectrometer (type 5100, resolution <152 eV at 5.9 keV). For the analysis, the probe area was adjusted to cover the whole individual pigment particle. In each case, the instrument was operated at an accelerating voltage of 100 kV and the contamination of the sample was minimised by using an anticontamination device supplied with liquid nitrogen, cooling the vicinity of the specimen holder.

The pigment powder was dispersed in a test-tube filled with distilled water and subjected to the action of an ultrasonic bath. The preparations were made by depositing a droplet of the aqueous suspension on an AEI type copper grid (Smethurst High-Light Ltd) covered with a thin carbon film. After drying in a dessicator, the samples were directly observed or analysed in the microscope.

The X-ray diffraction patterns were obtained using a Philips Norelco PW 1010 diffractometer, using a Cu target.

The XPS (ESCA) spectra were recorded on a VG ESCA 2 apparatus. The aluminum K_α line was used for the excitation ($h\upsilon$=1486.6 eV; generator: 10 kV, 50 mA; analysing energy: 90 eV). A Tracor Northern NS 560 accumulator was used to improve the signal/noise ratio. The pigment powder was pressed into a pellet and fixed on a sample support which was cooled by liquid nitrogen, both to reduce carbon contamination and to limit pigment destruction by heating.

The spectra in the normal infrared range were recorded on a KBr pellet with a Beckman IR-12 spectrograph. Far infrared spectra were recorded on Nujol mull pellets using a Digilab Fourier transform spectrometer.

Results and discussion

Refs, 3, 7-10

Synthesis and ageing of molybdenum red pigment

A molybdenum red pigment, with an overall composition corresponding to $Pb(Cr_{0.79}Mo_{0.09}S_{0.12})O_4$ was synthesised in the laboratory. Samples were collected at various times during the precipitation, a representative sequence of samples is given by RA, RB, RC, RD and RE, the final product had a deep red colour. Sample RS was collected after storing the powder in a humid atmosphere for 6 months, by which stage the pigment had turned yellowish.

Figure 1 presents a series of electron micrographs; it shows the presence of more or less cubic particles, the size of which increases progressively from 0.2 to 0.8 μm during precipitation.

Figure 2 presents X-ray diffraction patterns of samples RA to RE. It shows that the precipitation is more complex than suggested by the electron micrographs. The sample obtained at the beginning of precipitation (RA) shows an X-ray pattern[3,9] identical to that of $PbSO_4$, the colour of the precipitate was light pink suggesting the sample was lead sulfate rather than isomorphous lead chromate or a solid solution of chromate and sulfate, which would have been yellow[7]. This interpretation is confirmed by X-ray photoelectron spectroscopy which indicates a Pb/S atomic ratio close to 1 and a very weak Cr signal.

As precipitation proceeded, the $PbSO_4$ pattern diminished, while another pattern, characteristic of the pseudo-tetragonal solid solution, developed. Therefore, in the electron micrographs of samples RC and RD, the bigger particles were growing pseudo-tetragonal pigment crystals, while the small particles were dissolving $PbSO_4$ crystals.

The sample RS, obtained after storing, no longer showed cubic particles but only large needles about 5-6 μm long. Its X-ray diffraction pattern presented in Figure 3, corresponds to the lead chromate-like monoclinic solid solution. According to these observations there is an error of labelling in Figure 5 of the paper by Martorell[7].

Synthesis and ageing of molybdenum orange pigment

An orange molybdate was synthesised in the laboratory; its overall chemical composition, $Pb(Cr_{0.79}Mo_{0.09}S_{0.12})O_4$, was the same as the red molybdate but the experimental conditions differed. Samples were collected at various times during the precipitation, a representative sequence of samples is given by OA, OB, OC and OD. Sampling was also performed during ageing of up to 150 hours in the mother solution, both with and without stirring; samples OE, OF, OG and OH constitute a sequence representative of ageing under unstirred conditions.

As precipitation progressed, the hue changed from light to deep orange. Upon ageing, the pigment turned more yellowish, the change being faster with stirring.

Figure 4 presents a series of electron micrographs of

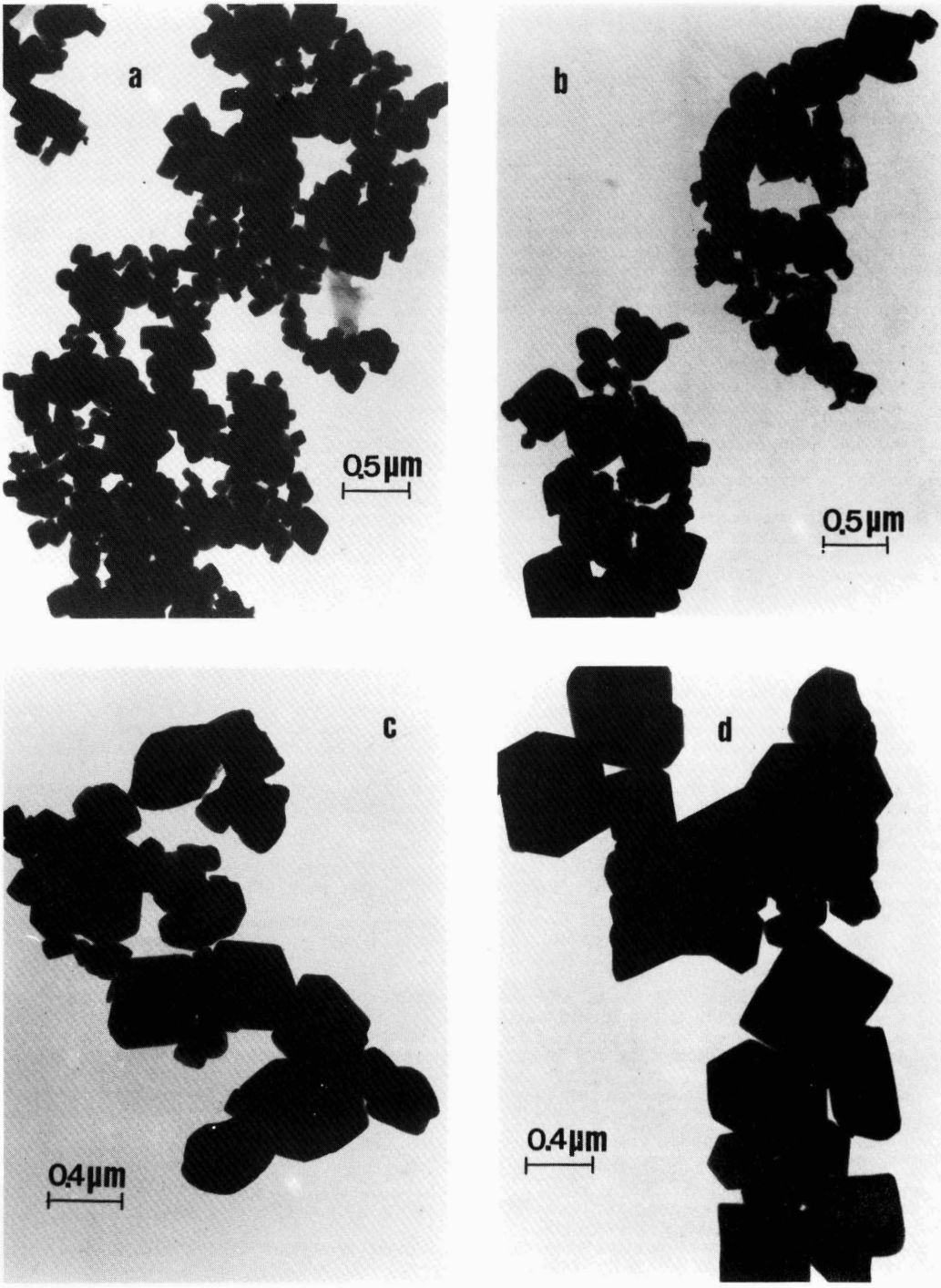

Figure 1. Electron micrographs during the precipitation of a molybdenum red pigment

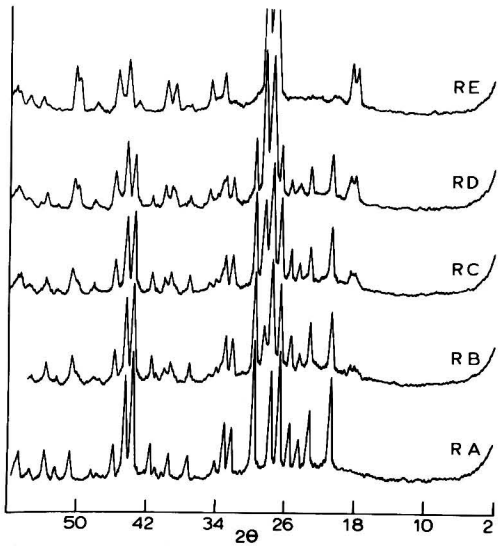

Figure 2. X-ray diffraction patterns of the different stages (A,B,C,D,E) of the precipitation of molybdenum red pigment

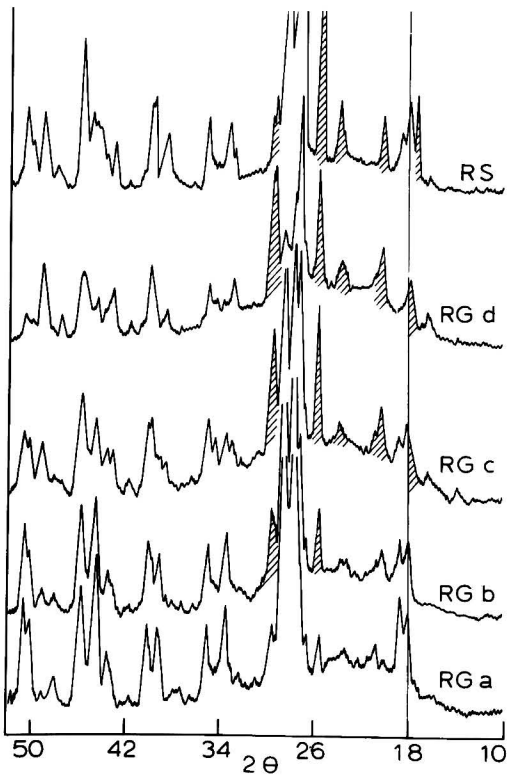

Figure 3. X-ray diffraction patterns of the molybdenum red pigment stored for 6 months (RS) and of the pigment ground for increasing periods of time (RG a, b, c, d). The shaded peaks are characteristic of the monoclinic phase

precipitation. At the beginning of the precipitation (OA), various types of particles are observable: fine needles, dark globular particles (~0.1 μm) and very small light particles. As the precipitation progresses the latter disappear progressively, simultaneously the dark globular particles grow reaching an average size of 0.3-0.4 μm, whilst the needles reach a length of about 2 μm.

Ageing (Figure 5) was marked by a re-dissolution of globular particles and a strong increase in the size of the needles up to 5 μm. Stirring produced similar results but faster than in unstirred conditions.

A microanalytical examination of individual particles showed that the small light particles observed at the first stage of precipitation contained neither chromium nor molybdenum, they were thus presumably made of $PbSO_4$. The globular and needlelike particles did not show any significant difference in chemical composition. An XPS analysis confirmed, as illustrated by Table 1, that there was no difference in chemical composition between the freshly precipitated pigment and the aged pigment, and that the precipitate obtained at the earliest stage of precipitation contained more $PbSO_4$.

The X-ray diffraction patterns of the same samples are presented in figures 6 and 7. They can be interpreted by considering three different phases, the progress of which are quite different from each other. A phase showing the same peaks as the orthorhombic $PbSO_4$ phase was present at the early precipitation phase and disappeared as precipitation proceeded, this was undoubtedly represented by the small light particles observed by electron microscopy. As precipitation progressed the peaks characteristic of the pseudo-tetragonal solid solution and the lead chromate like monoclinic solid solution developed. Upon ageing the pseudo-tetragonal phase tended to disappear while the peaks of the monoclinic phase increased in intensity.

These observations indicate that the globular particles were the pseudo-tetragonal phase; the acicular particles, either present in the orange pigment or produced when both orange and red pigments were aged in the presence of water, corresponded to a lead chromate-like phase with the same chemical composition as the pseudo-tetragonal phase.

Grinding of molybdenum red pigment

It has been reported[7,8] that grinding a molybdenum red pigment may produce a transformation of the pseudo-tetragonal phase to the lead chromate-like monoclinic phase, provoking a colour change towards more yellowness.

Table 1

XPS analyses of samples collected at different stages (OA and OD) of the precipitation and at the end (OH) of the ageing of an orange molybdate pigment

	Sample OA	Sample OD	Sample OH
Pb/Cr	4.2	1.8	2.0
Pb/S	2.7	9.3	7.8
Pb/Mo	17.0	15.7	16.4
Pb/O	0.19	0.19	0.22
Cr/O	0.05	0.11	0.11
Mo/O	0.01	0.01	0.01
S/O	0.07	0.02	0.03

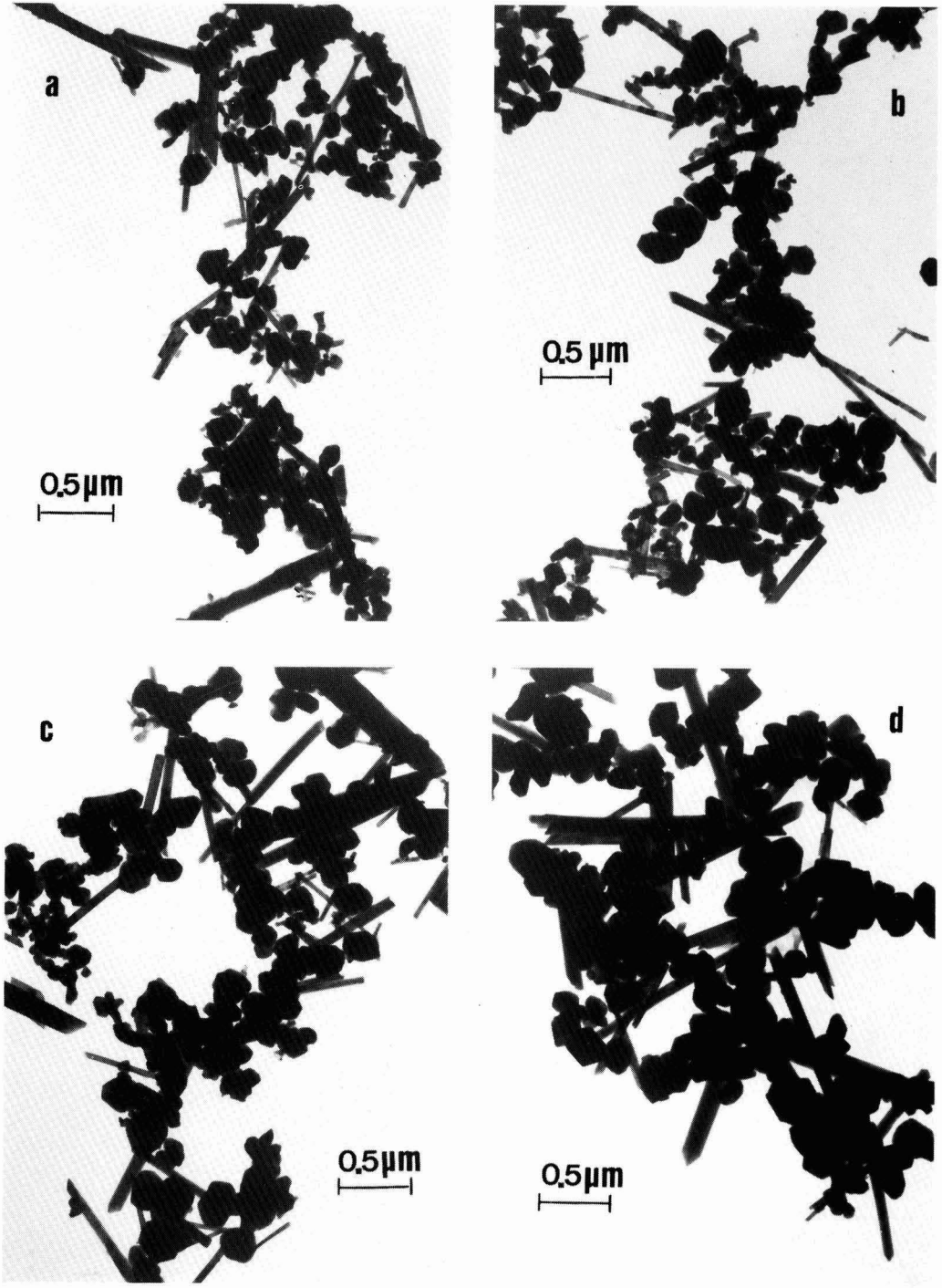

Figure 4. Electron micrographs during the precipitation of a molybdenum orange pigment

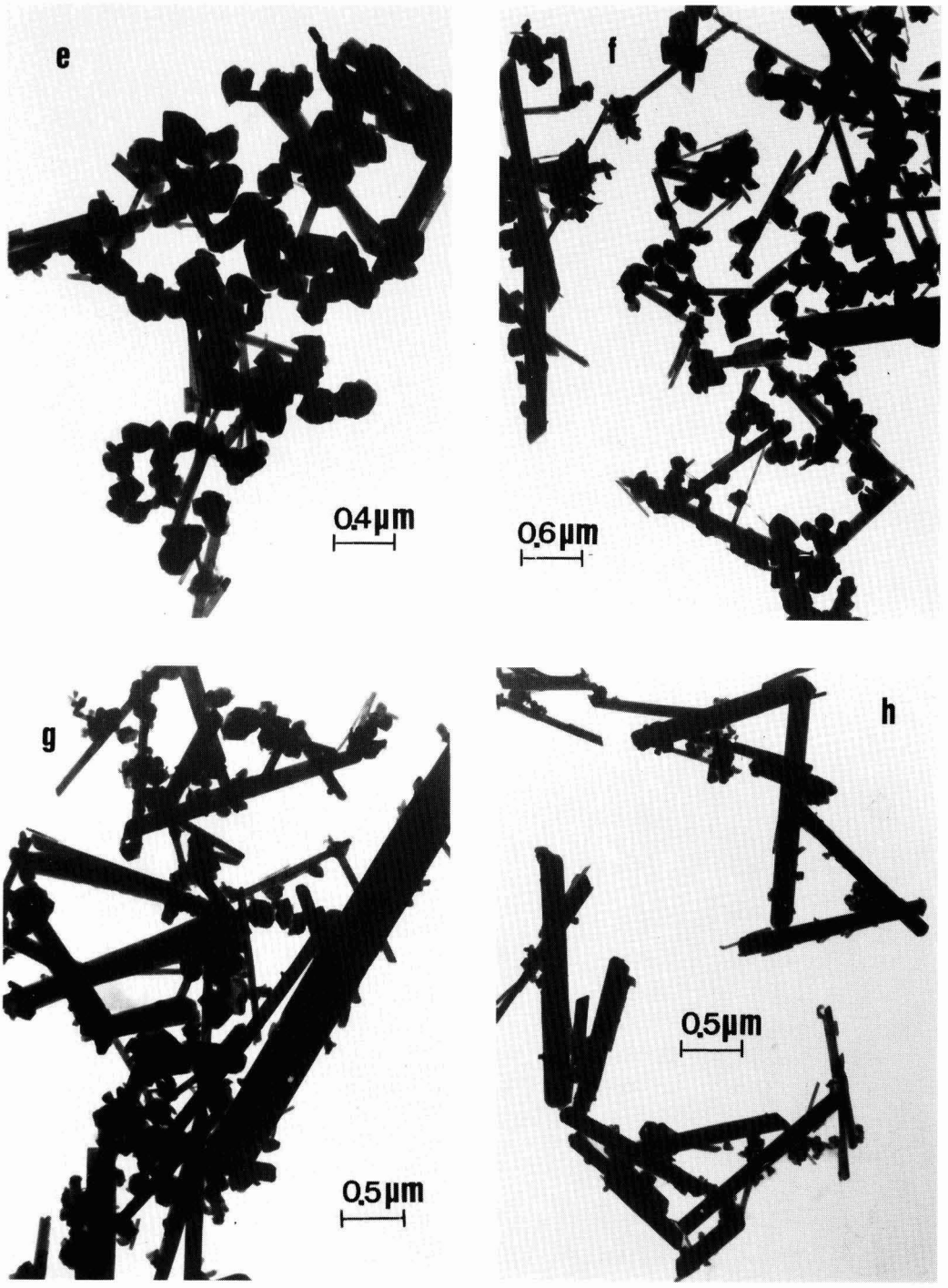

Figure 5. Electron micrographs during the ageing of a molybdenum orange pigment

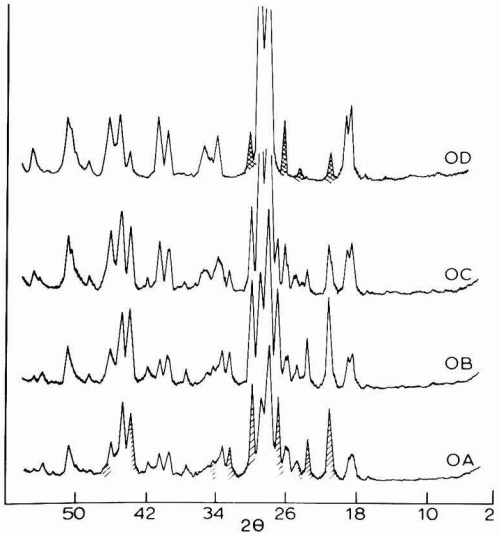

Figure 6. X-ray diffraction patterns of the different stages (A,B,C,D) of the precipitation of molybdenum orange pigment. The shaded peaks in diagrams OA and OD are characteristic of $PbSO_4$ and of the monoclinic solid solution respectively

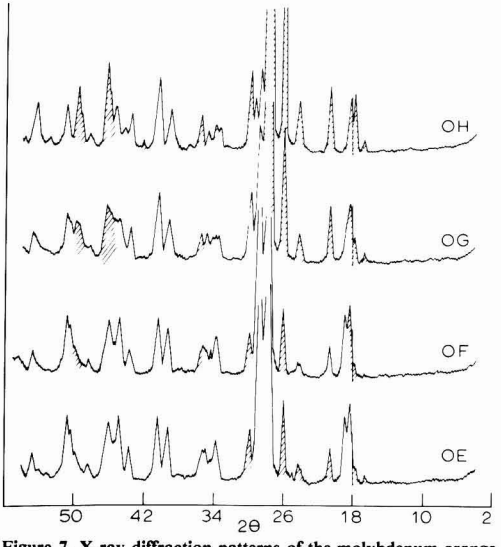

Figure 7. X-ray diffraction patterns of the molybdenum orange pigment during ageing (E,F,G,H) in an unstirred solution. The shaded peaks are characteristic of the monoclinic phase

A red pigment similar to that described above was ground manually in an agate mortar and samples RGa, RGb, RGc and RGd were collected at various times. Figure 9 illustrates the progress of the comminution which gave rise to a progressive yellowing of the pigment.

The X-ray diffraction patterns presented in Figure 3,

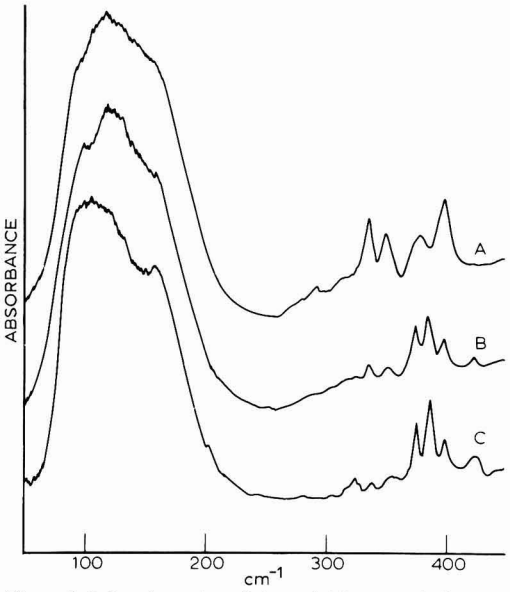

Figure 8. Infrared spectra of the molybdenum red pigment, untreated (A) and ground (B, cfr RGd Figure 3) and of G-type chromium yellow pigment (C)

confirm that grinding results in the destruction of the pseudo-tetragonal phase and the development of peaks characteristic of the lead chromate-like monoclinic phase.

The infrared spectra of a typical chromium yellow pigment (G type, $PbCrO_4$) which is monoclinic, of a molybdenum red pigment similar to that described above and of the latter extensively ground in an agate mortar were compared. In the normal infrared range the only difference between the samples was in the relative intensity of the bands characteristic of sulfate (1063, 629 and 598 cm^{-1}) and chromate (855 cm^{-1}).

However, differences were noted in the far infrared region presented in Figure 8. The bands appearing between 300 and 400 cm^{-1}, which reflect the long distance organisation of the solid, show that the red pigment is different from the yellow pigment but becomes similar to the latter after grinding, as observed by X-ray diffraction.

It is clear from electron micrographs and expected from the dry conditions of grinding that the monoclinic phase did not develop through the growth of crystals similar to those that developed upon ageing under wet conditions. The phase transformation thus occurred through a process in the solid state, resulting from a mechanical stress. This may presumably take place by the slipping of crystalline layers or chains of anions[10] with respect to each other.

Systematic examination of industrial pigments

A collection of various molybdenum red and orange pigments originating from various manufacturers were examined by X-ray diffraction under standardised conditions. Some contained the lead chromate-like monoclinic phase, the relative abundance of which was measured by the height of the peak at $2\theta=20.5°$.

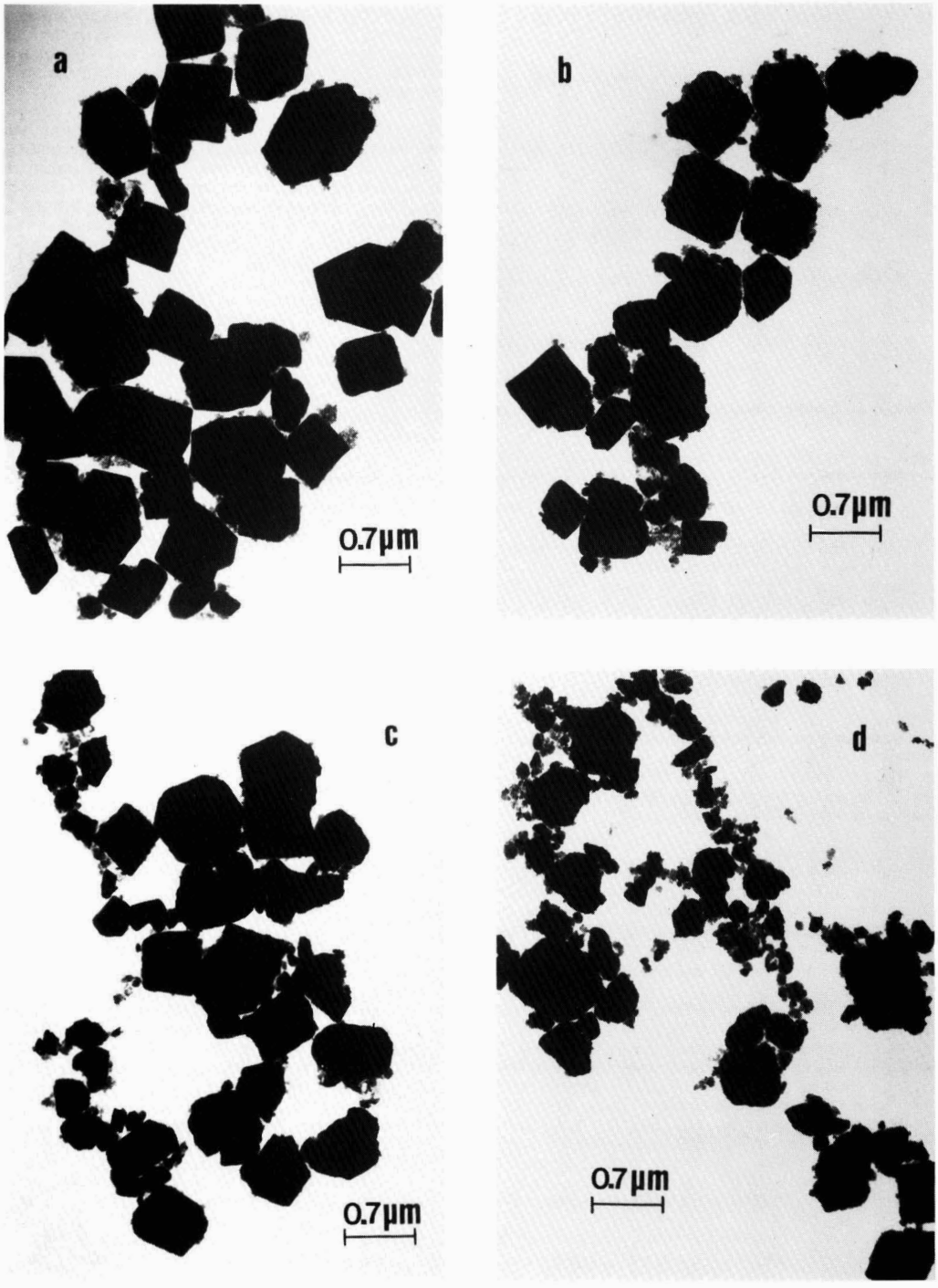

Figure 9. Electron micrographs during the comminution of a molybdenum red pigment

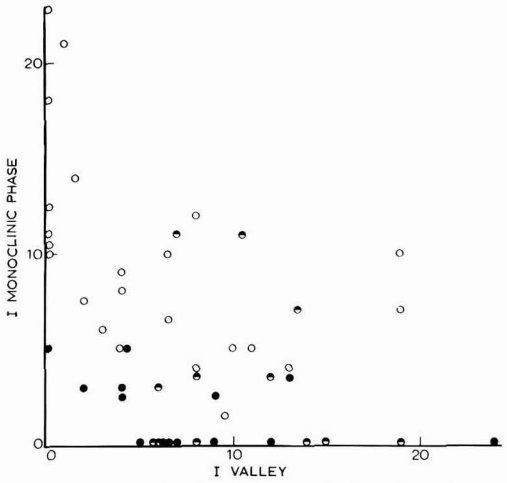

Figure 10. Relationship between the intensity of the characteristic peaks of the monoclinic phase (2θ=20.5°) and the depths of the valleys (2θ=18°) orange (○), red (◒) and deep red (●) pigments

In all cases the major component was the pseudo-tetragonal phase but the samples differed in the shape of the peaks around 2θ=18°. With some pigments two peaks are separated by a well defined valley (RE, Figure 2), with others the valley is not well defined (0G, Figure 7), with a few pigments three peaks are observable (RC, Figure 2). The depth of the valley was measured with respect to the top of the highest peak of the doublet.

Figure 10 shows a plot of the intensity of the peak characteristic of the monoclinic phase versus the depth of the valley, no significant correlation was found between the two parameters. The shape of the peaks around 2θ=18° is presumably related to the distortion of the lattice as compared to pure lead molybdate crystals, its variability might be due to heterogeneity in the chromate-sulfate-molybdate solid solution.

The plots in Figure 10 allow a distinction to be made between the orange, red and deep red pigments and show that the orange pigment is always associated with the lead chromate-like monoclinic phase, electron micrographs of these pigments always show the presence of acicular particles.

Conclusion

It has been confirmed that the pseudo-tetragonal phase present in the molybdenum red and orange pigment is represented by globular particles, while needlelike particles correspond to the lead chromate-like monoclinic phase. However, there is no significant difference in chemical composition between the two types of crystals.

The pseudo-tetragonal phase is converted into the monoclinic under wet conditions through a dissolution-re-precipitation process, this explains the role of stabilisers which act as diffusion barriers, limiting the rate of dissolution of the pseudo-tetragonal phase. On the other hand, the pseudo-tetragonal to monoclinic transformation can occur as a simple phase transition induced by mechanical stress applied by grinding.

In all cases, the presence of the lead chromate-like monoclinic phase is responsible for a more yellowish colour whatever the particle size. This has been confirmed by the examination of industrial pigments; the orange colour is always associated with the presence of the monoclinic phase and of needlelike particles. The difference between the various hues of the red pigments is a result of particle size.

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Water borne acrylics and urethanes for the coatings industry*

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Summary

New concepts in the preparation of acrylic emulsions and urethane resins in water have opened new applications for the paint industry. This paper deals with their technology, film formation and compares the properties of various systems.

Keywords

Types and classes of coatings and allied products
emulsion paint

Raw materials for coatings
binders (resins, etc.)
acrylic resin
urethane resin

Properties characteristics and conditions primarily associated with
bulk coatings and allied products
water dispersible

Miscellaneous terms
formulation

Les résines acryliques ou uréthannes diluables à l'eau pour l'industrie de peintures

Résumé

Des nouveaux concepts dans le domaine de la préparation des émulsions acryliques et des résines uréthannes diluables à l'eau ont présentés d'autres possibilités à l'industrie de peintures. Cet article traite, à l'égard de ces émulsions et résines, de leur technologie, de leurs caractéristiques filmogènes et fait une comparaison de leurs caractéristiques en divers systèmes.

Wässrige Acryldispersionen und Urethanharze für die Lackindustrie

Zusammenfassung

Neue Vorstellungen über die Herstellung von Acryldispersionen und wässrigen Urethanharzen haben andere Möglichkeiten für die Lackindustrie geschaffen. Dieser Aufsatz handelt, hinsichtlich dieser Dispersionen und Harze, von ihrer Technologie, Filmbildung und stellt einen Vergleich ihrer in verschiedenen Systemen entstandenen Eigenschaften dar.

Introduction

Important advantages such as reduced air pollution, improved plant safety, energy savings and reduced toxicity have accelerated development of water borne coating systems that can compete with and replace conventional air drying and low bake solvent based systems. Sometimes they can even successfully replace thermosetting coatings without sacrificing quality and application properties. Recent developments have brought forth products that overcome the deficiencies of earlier developments. Improvements include lower surface tension for better wetting and better plasticizing systems resulting in smoother film formation. The introduction of cross linking systems has lead to improved chemical resistance and anti-blocking properties, and the ability to cure using low energy demand systems. New polymerisation techniques, together with a proper choice of raw materials have resulted in necessary improvements in paint properties such as gloss, adhesion, hardness, and resistance to abrasion, water and chemicals.

Water borne coatings, applied by conventional application methods can be successfully utilised in a wide variety of areas and although not every application can use water based products, the list is rapidly growing.

Acrylic emulsions

Refs, 1,2

Early acrylic emulsion polymers showed a number of defects making them less attractive in high quality coating applications. Paints based on these emulsions had insufficient wetting, flow, gloss and hardness, moreover, they lacked the paint-like structure of solvent based systems. Resistance properties needed improvement to achieve acceptable standards. The limited availability of inexpensive acrylic monomers and emulsifiers, together with the assumption that the polymers should mainly be internally plasticized to achieve proper film formation has restricted the use of this type of polymer to applications such as interior wall paints, leather finishes and some printing ink applications. Typical representatives of such polymers are presented in Table 1.

The moderate flow and wetting properties were mainly the result of the high surface tension of the polymers, thus

Paper presented at the South African Division's 8th National OCCA Symposium

Table 1
Early acrylic emulsion polymers

	Latex A	Latex B
Water	58	46
Emulsifiers/colloids	2	2
Ethyl acrylate	28	
2-Ethylhexyl acrylate		9
Acrylic acid	1	1
Methyl methacrylate	11	
Vinyl acetate		40
Dibutyl phthalate		2
Solids (%)	42	52
Viscosity at 25°C (cps)	200	2000
Min. Filmforming Temp. (MFT) (°C)	3	20
Surface tension (dynes/cm)	48	50

restricting their use mainly to substrates that would absorb. Emulsions having low minimum film forming temperatures moreover, needed high pigment loading to overcome blocking and dirt pick-up problems. Improving the coating hardness by the use of pigments and fillers in higher concentrations resulted in films with low gloss. The formulations shown in Table 1 were partly based on water sensitive ingredients, including monomers such as ethyl acrylate and vinyl acetate and high concentrations of non-ionic emulsifiers and water soluble colloids. Since the earlier acrylic or vinyl acetate/acrylic polymers were coarse in particle size, this property affected film formation negatively, as postulated by Dillon Matheson and Bradford[1]. Factors which play a role in this concept can be found in the Frenkel[2] equation Figure 1.

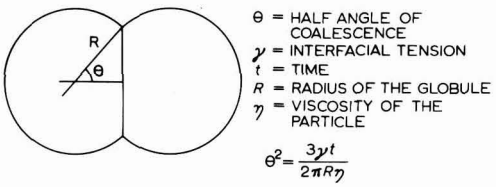

Figure 1. Frenkel model

In Frenkel's model, which is specifically constructed to represent fusion of two liquid drops, it can be seen that the degree of fusion is a function of interfacial tension and time, that it is inversely proportional to the radius of the particles, and to the polymer particle viscosity. Since for a given dispersion the interfacial tension, the time of fusion and the particle viscosity can be held constant, it can be concluded that the degree of fusion is dependent on the diameter of the polymer particles. Therefore, the smaller the particle, the greater the fusion force.

During the past decade, activity in polymer research has been increasingly concerned with the environment. It was challenging to improve the earlier water borne polymer concepts further, to overcome the defects that existed and thus make them less harmful to the environment. Improvements in polymerisation know-how led to emulsion polymers with a narrow distribution of very fine particles. By selecting proper and well defined reaction conditions, limited molecular weight distribution was achieved. The introduction of newly available emulsifiers and surface active agents, tailored to perform optimally even in small concentrations, created products with lower surface tension and improved properties such as wetting, flow out and water and humidity resistance.

Table 2
New concepts in acrylic emulsion

	Latex C	Latex D
Water	48.4	48.3
Anionic emulsifier	0.5	0.5
Butyl acrylate		9.0
Butyl methacrylate	24.0	
Methyl methacrylate	16.0	9.0
Styrene		19.0
Functional monomers	3.0	3.0
Surface active agents	0.1	0.2
Coalescents	8.0	10.0
Solids (%)	42	40
Viscosity at 25°C (cps)	150	250
Min. film forming temp. (°C)	48	50
Surface tension (dynes/cm)	36	32

Coating performance depends to a large extent on the choice of basic raw materials. Where earlier emulsion polymers were based on monomers such as ethyl acrylate, vinyl acetate etc., present products are built up from monomers such as butyl esters of acrylic and methacrylic acid, acrylonitrile, styrene and a wide variety of functional monomers.

This results in polymers with increased gloss, better pigmentation characteristics, improved resistances and possibilities for crosslinking. The new concepts in acrylic polymer production also demonstrate increased minimum film forming temperatures compared to the earlier products. Table 2 shows some typical examples of the new generation of acrylic dispersions.

The higher minimum film forming temperatures require the addition of well selected film forming aids such as highly volatile coalescents of the glycol ether type.

Proper coalescent selection enables the formulator to regulate drying time. Coatings based on these starting points in which the binders do not contain excessive amounts of either internal or permanent plasticizer, demonstrate improved hardness without failing in wear, crack resistance and flexibility. The increased hardness also enables the formulator to lower the pigment volume concentration, thus yielding high gloss coatings without dirt pick-up and with sufficient exterior durability and cold check resistance.

To summarise, it can be stated that the smaller emulsion particle size and the use of temporary plasticizers that reduce the internal viscosity of the polymer particles, produce emulsions that have greatly improved film forming compared to the earlier products.

Table 3 lists the properties of the early emulsions versus the properties of the improved polymers that have gained complete acceptance in the coatings industry.

Water borne urethanes

Refs, 3,4

Polyurethanes as binders in coatings have achieved commercial importance only in the last twenty years. These

Table 3
Early emulsions versus new emulsions

	Early emulsions	New concepts
Physical properties:		
Appearance	opaque	opaque-transclucent
Particle size (μm)	<1	<0.1
Molecular weight	>1 million	>1 million
Viscosity at 25°C (cps)	25-300	100-300
Surface tension (dynes/cm)	40-55	30-40
Min. film forming temp. (°C)	<20	>20
Formulation:		
Pigment dispersibility	poor	good
Pigment stability	good	good
Viscosity control	thickeners	pH control
Flow	poor	excellent
Performance:		
Solids (%)	high	med-high
Specular gloss	low	high
Resistance properties	excellent	excellent
Toughness	excellent	excellent
Durability	excellent	excellent
Hardness	soft	hard
Hardness development	fair	quick

polymers have gained acceptance because of their overall balance of properties: high tensile strength, excellent abrasion resistance and good resistance to solvents. Their growth in popularity has been limited by high prices and difficulty in handling. In general, the commercial systems were either solvent based reactive high solids prepolymers to be reacted with a second component, solvent based moisture curing types or fully reacted urethane lacquers generally dissolved in alcohols and aromatic solvents. Emission and safety regulations, together with the escalating cost of solvents were the main consideration in the development of alternatives to the solvent rich systems. One of the most challenging approaches was the attempt to substitute solvents by water, despite the fact that isocyanates react very easily with water. As early as 1943, Schlack[3] reported the preparation of aqueous urethane solutions. He reacted a diisocyanate with a diol that had a tertiary amine group to produce a prepolymer which was then soluble in an aqueous acidified medium. The resultant polymers had a high level of amine groups closely spaced and consequently the films were hygroscopic and brittle.

In the early 1960s new approaches were found, for instance urethanes that were the reaction products of long chain polyethylene glycol ethers with diisocyanates. However, the hydrophilic nature of these polymers rendered them useless as coatings materials. Moreover, their higher cost compared to competitive resin systems resulted in a minimal amount of acceptance by industry.

A further technique was to react polyesters or polyethers with an excess of diisocyanate to yield NCO terminated low molecular weight prepolymers, which could be emulsified and chain extended by diamines in water to form more or less stable dispersions. The emulsions in these systems were formed by high speed dispersion equipment, yielding large particle size latices. In general, urethane coatings and films produced by this method require post-curing at temperatures above 100°C to improve the water resistance and tensile properties. The generally soft character of the films has prevented their use in paints and other protective coatings.

A major breakthrough was reported by Dietrich *et al.*[4], on the preparation of spontaneous dispersions of polyurethane ionomers. These dispersions are distinguished by the presence of ionic groups in the polyurethane chain. The process used for the manufacture of such colloidal urethane resins begins with reacting a polyether or polyester diol with an excess of diisocyanate in a small amount of solvent. By selecting proper poliol/diisocyanate ratios, a low molecular weight, high solids prepolymer is thus prepared. In addition, an acidic solubilizing group is reacted into the prepolymer backbone. This group functions as a site for water dispersibility, after neutralisation with an appropriate base. The neutralised prepolymer is dispersed in water and then extended with a diamine. The resulting urethanes can be classified as colloidal dispersions due to their small particle size (less than 0.1 microns). In accordance with the Frenkel model such polymers demonstrate excellent film formation. Table 4 shows typical specifications of these water borne urethanes.

Table 4
Typical specifications of water borne urethanes

	Type A	Type B	Type C
Type of urethane	aliphatic	aliphatic	aromatic
Total solids (%)	34	40	30
pH	7.8	8.0	8.0
Viscosity at 25°C (cps)	250	300	250
Appearance	translucent	white-translucent	yellow-translucent
Solvent on total (%)	17	5	11

Since the urethanes are fully reacted they do not contain any free diisocyanate, thus minimising toxicity. Features of this new class of urethane binders are their outstanding properties, similar to their solvent based counterparts.

Table 5 compares properties of water borne urethanes with and without a polyfunctional aziridine cross linking

Table 5
Comparison of water borne versus moisture curing urethanes

Film properties	Water borne	Water borne with cross linking agent	Moisture cure
Drying time to tack free at 20°C and 50% RH in minutes	210	210	110
Sward Hardness			
24 hours	38	38	24
7 days	44	44	45
Taber abrasion, SC-17 1000 gr/1000 cycles/mg	28	15	22
Water resistance, 24 hours	7	9	10
Chemical resistance, 24 hours			
IPA	1	10	10
Toluene	10	10	10
DM water	7	9	10
1.0 N KOH	10	10	10
Mar resistance			
24 hours	6	9	9
1 Week	6	9	10
Gardner Scrub resistance			
500 cycles 2% Spic&Span	10		10
500 cycles DM water	9		10

10 = best 1 = worst

Table 6
Comparison of water based wood lacquer systems

Swedish test procedures	Acrylic polymer without cross linking agent	Acrylic polymer with cross linking agent	Acrylic/urethane polymer (3:1) with cross linking agent
Taber abrasion, SC-17, 1000 gr, 1000 cycles, mg.	60	45	35
Scratch resistance (mar)	3	4	5
48% ethanol, 16 hours	3	4	4
Water, 24 hours	4	5	5
Coffee, 16 hours	4	5	5
Grease on scratch, 24h	5	5	5
Acetone, 2′	2	4	5
Hot pan test, dry, 15′	2	5	5
Hot pan test, wet, 15′	2	4	5

5 = very good, 0 = bad

agent, with a typical solvent based moisture curing urethane.

Application

These new acrylic emulsions and water borne urethanes offer improved properties and environmental advantages over many conventional solvent based systems. In addition, further improvements are available to the formulator as a result of the efforts of suppliers of coatings additives. Starting from the time that the first water based binders were developed, coatings additives that act in a similar way to the additives used earlier in solvent based paints have come onto the market. Such materials include cross linking, defoaming and dearating agents, thickeners e.g. based on urethane technology, wetting agents, flow and leveling agents and film forming aids. It should be pointed out that low volatile coalescents are helpful in securing good film formation under critical conditions such as high RH, low temperatures, porous substrates etc. The fact that the polymers described have viscosities that can be regulated by pH control has resulted in coatings that demonstrate a paint like structure. Also, the addition of proper coalescents will have a positive effect on this property. Selection of the neutralising agent is of paramount importance in controlling drying time, viscosity, pigmentability and stability of formulations incorporating melamines. Ammonia is preferred in air drying applications to improve hardness and chemical resistance. Volatile tertiary amines, for example, should be applied in stoving applications where melamines are used for cross linking.

Since in both resin types functional groups are incorporated, improved properties can be achieved by cross linking, e.g. with multifunctional aziridines or melamines. Also self-cross linking binders are available within the acrylic polymer group, which produce better wet adhesion and exterior durability.

The addition of external cross linking agents has a major effect on chemical, heat and abrasion resistance. Table 6 compares properties of wood lacquer systems applied with and without cross linking agent.

Since in many cases acrylics and urethanes, as

Table 7
Water based binders achieving optimum properties

Application	Dry film characteristics			
	Physical properties	Resistance properties	Exterior durability	Special requirements
Application rheology acrylic or styrene/acrylic	Hardness urethane	Chemical resistance urethane and acrylic both cross linked	UV stability acrylic or aliphatic urethane	FDA
Cure speed acrylic or styrene/acrylic	Adhesion acrylic	Humidity resistance styrene/acrylic or urethane	Colour retention acrylic or aliphatic urethane	Stain resistance urethane
Block resistance urethane	Flexibility urethane	Water resistance styrene/acrylic or urethane	Gloss retention acrylic or aliphatic urethane	Food resistance
	Toughness urethane	Corrosion resistance styrene/acrylic or urethane	Exterior flexibility urethanes and self cross linking acrylics	Electrical properties
	Gloss styrene/acrylic	Abrasion resistance urethane		Cold check resistance acrylic
		Mar resistance acrylic		Print resistance acrylic
				Sandability acrylic
				etc., depending on use

Table 8
Applications

Substrate	Acrylic dispersions	Urethane dispersions	Combinations of acrylic/urethane
Metal	anticorrosive primers, high gloss one-coat systems, aluminium lacquers	strippable coatings, industrial paints	industrial paints
Wood	furniture lacquers, panelling lacquers, brushable paints		parquet lacquers, wood stains
Plastic	vinyl coatings, PS/ABS coatings	non-wax PVC flooring, PU mouldings, PVC topcoats, PC primers	gym flooring
Concrete	asbestos-cement coatings, gypsum impregnators, terrazzo polishes	concrete sealers, exterior paints	seamless flooring
Paper and plastic film	wood imitation paper coatings, overprint lacquers, paper/carton coatings, flexo inks	PVC screen inks, wallpaper coatings, gravure printing inks	PVC PE-MS gravure inks
Textile leather	binders, impregnation	adhesives, topcoats	

discussed above, are mutually compatible, combinations offer further advantages with respect to price and balance of properties. Proper selection of binders, as indicated in Table 7, offers a successful basis with which to replace solvent systems based on conventional binders such as cellulosics, vinyls, solvent based urethanes, alkyds and epoxies. In most cases, the new coating systems can be applied by existing techniques and equipment, requiring

lower cure temperatures or even air drying conditions to obtain comparable results. Selective formulation will lead to products that can meet the most severe requirements with regard to environmental pollution and working area conditions.

The practical applications of these acrylic and urethane dispersions or combinations of the two as listed in Table 8 are now commercial. Further research and a close co-operation between binder suppliers, paint producers and customers will undoubtly increase their use.

[*Received 13 February 1981*

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1. Dillon, R. E., Matheson, L. P. and Bradford E. B., *J. Colloid Sci.*, 1951, **6**, 65.
2. Frenkel, J., *J. Phys*, (USSR), 1945, **9**, 385.
3. Schlack, P., Ger. Pat. 950.240, Bobingen AG, für Textil Fasern, 1943.
4. Dietrich, D., Kleberle, W. W. H., *Angew Chem.*, 1970, **82**, 53.

Next month's issue

The Honorary Editor has accepted the following papers for publication. They are expected to appear in the August issue of the *Journal:*

pH Shift in acidic lithographic fountain solutions – the influence of drier type *by L. Campey*

Coatings for galvanised steel in industrial building *by A. D. Clothier*

Maleopimaric acid from gum rosin of Pinus roxburghii *by S. C. Saksena, H. Panda, B. M. Kapoor, Ahisanuddin and Rakhshinda*

Ultimate strength of paint films *by A. Toussaint and L. D'Hont*

Further information on any of the publications reviewed 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 publisher.

reviews

Colour

Helen Varley, Ed

Mitchell Beazley, London

pp. 256, price £19.95

Many years ago Professor Lancelot Hogben wrote two books "Mathematics for the Million" and "Science for the Citizen" attempting to present these disciplines in an easily understandable way to the ordinary person. He was successful.

This book "Colour" could well have the parenthesis "for the community", since it attempts to explain not only the theory of colour, but its impact on the daily life of the average person. In its beautifully designed pages it discusses colour in every aspect, metals, animals, insects, paintings, decorative art and photography.

Although it cannot by any stretch of imagination be classed as a text book, the reviewer found much to make him more aware of the subtle nuances of colour in advertising and photography. It is, however, the sheer visual impact of the colour printing in the book which impresses and it would be of considerable use to art students and architects as well as advertising agents.

As might be expected both colour balance and registration of the prints are excellent.

Reader Enquiry Service No. 21 D. S. Newton

Health and Safety – Environmental Pollution and the Paint Industry, 2nd edition

L. A. O'Neill

Paint Research Association, 1981

pp. xi + 173, price £40.00, card covers

This book covers health and safety legislation worldwide as applied to the surface coatings industry, and includes sections on codes of practice, toxicology, atmospheric pollution, and transport. Not surprisingly, UK legislation is dealt with in most detail followed by the USA, the EEC and Japan. In each case the relevant Act is quoted in sufficient detail to enable the reader to appreciate its implications, a most important factor when considering exports.

As would be expected in a publication from this source, references are numerous (592) and the format easily readable.

The writing of a reference book of this type is a herculean task, and as the director of the PRA writes in the preface an on going one, since legislation of some sort or another is always being introduced. One hopes that some form of updating of this important subject will be introduced.

Reader Enquiry Service No. 22 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

Precious metals

Following the AGM of the London Section on 23 April 1981 at the Rubens Hotel. Mr J. Hutchins, Technical Manager – Precious Metals – Johnson Matthey Metals Ltd, presented a lecture entitled "Precious metals".

Mr Hutchins explained how gold is found in every continent and civilisation. Gold has been used to make articles from buckles to the death mask of Tutankhamen. The various reasons for gold's importance were given and these included durability, workability, scarcity value, mystic quality and the fact it has no intrinsic value.

Gold, silver and platinum have now become essential to modern technology and have been responsible for advancements in several fields. Typical uses include: amalgams for dentistry, casings for heart pacemakers and catalysts for chemical processes.

The workings of the London Bullion Market were explained. The five members of the market meet twice a day to fix prices. This is designed to give stability for industries that rely on precious metals. Speculation in precious metals, commonplace in recent years, has severely affected certain industries, particularly the photographic film industry.

The lecture was concluded with a film on the use and extraction of platinum.

After an interesting question time a vote of thanks was proposed by Mr K. Arbuckle, to which the audience warmly responded.

B. A. Canterford

occa meetings

Bristol

Paint specifications acceptance procedures

The fourth lecture in the series was given by Mr R. L. J. Morris of the Materials Quality Assurance Directorate, Woolwich on the subject of "Paint specifications acceptance procedures as they affect the paint industry". The chairman, Mr Brooks, introduced the lecturer. This was the first lecture to be given in the new venue, The Avon George Hotel, due to the closing down of the Royal Hotel which had been the Bristol Section's meeting place for many years.

The speaker gave interesting details of the history of early specifications including one dated 1896 for varnish tar black and showed some written on linen paper. In the early specifications, details were often given of the proportions of ingredients to be used to prepare the material. The requirements of the MQAD had now changed to purchased products and new procedures would be introduced in the near future.

To emphasise the role of specifications and often the lack of them, an interesting short film made by the British Standards Institute was shown. It was believed that the difficulty in reaching agreement on specifications was shown by the comparatively small number of BSI paint specifications and the larger number of specifications issued by individual paint users. It was thought that a better understanding has been reached and that specifications in themselves do not provide a guarantee of the final performance, as the specification is only a part of the chain in the application and use of the paint.

Question time was extremely well supported by the members present and the vote of thanks was given by Mr D. S. Newton.

Organic pigments for liquid packaging inks

The fifth lecture was better attended and it was a pleasure to welcome members of the printing ink industry. Mrs Harper deputised for the Chairman, Mr Brooks, and the lecture entitled "Organic pigments for liquid packaging inks" was given by Mr D. G. Austin of Sun Chemicals Ltd.

The speaker gave a summary of all the main types of pigments available for liquid inks and gave the pros and cons associated with each type. Excellent visual aids to clarify the subtle differences in colour and colour reductions and stability were available. Differences in the choice and use of pigments in the USA and UK were described. Problems arising in the replacement of chrome pigments in both water based and solvent systems was considered.

There was a lively question time and the vote of thanks was given by Mr K. A. Chippington.

Solvent evaporation

The last lecture in the programme was given in South Wales for the first time in some years. The venue was the Post House Hotel on the outskirts of Cardiff near the motorway. There was a noticeable increase in the numbers attending and for this reason it was decided to make arrangements for a lecture to take place in South Wales in the next session.

Mr Brooks chaired the meeting and the lecture was given by Mr D. Clarke of BP Chemicals Ltd, Hull on "Solvent evaporation – some interesting aspects". The lecturer dealt with the physical characteristics of solvents – hydrogen bonding and solvent parameters – and the consequence of the interactions of solvent mixtures on the evaporation rate and the possibility of obtaining constant evaporation systems. The changes in composition which could occur during evaporation from all chosen mixtures of solvents and their effect on the performance of surface coatings based on them was described. Question time was again well supported and the vote of thanks was given by Mr K. A. Chippington.

J. R. Taylor

news

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.

Ford trucks cathodically electropainted

In an £8.5 million anticorrosion programme following a survey of 5,000 trucks in 650 European locations, Ford has introduced International ED 3002 cathodic electropaint primer at its two British factories for commercial vehicles. The Southampton plant, with a 300,000 litre tank, is believed to have Europe's largest cathodic installation. At Langley, where the new Cargo truck range is produced, it is their first paint operation.

With International ED 3002 (supplied by International Paint under licence from PPG Industries in America), both plants have increased their saltspray specification from the anodic standard of 240 hours to a minimum of 480 hours.

In addition, Ford has changed to the International Paint polyester surfacer, Minsand, which is already being used on Ford cars made at Dagenham and Halewood. It is the most widely applied surfacer over anodic as well as cathodic electropaint in Britain.

Reader Enquiry Service No. 31

Pira launches Colour Centre

The Pira Colour Centre was officially opened on 28 May. The Centre has been set up to meet the needs of originators, producers and users of colour print. It establishes an independent authority for research, the provision of unbiased technical information and training to all those associated with design, origination, reproduction and use of printed colour work. It is intended to make a significant contribution to the cost competitiveness of UK colour printing and to act as a focal point for everyone in the printing industry to assess and utilise high technology as a means of achieving unit cost reduction.

Reader Enquiry Service No. 32

New coating inspection company

A new specialised coatings inspection company, ITI Anti-Corrosion Ltd, has been established in the UK with a subsidiary in Houston, Texas. The company provides worldwide services for inspection of all types of structural painting or other coating systems, for pipeline coatings of all types and for thermal insulation. At the same time it provides technical advice and operates comprehensive training schemes for its own staff and for outside engineers concerned with the quality control of coatings. Already a number of major contracts for work onshore and offshore have been obtained and further contracts are under negotiation.

ITI Anti-Corrosion was formed by a group of directors, managers and senior inspectors with a combined experience of over 200 years in specialised inspection of the various disciplines involved. It is financed by John Lelliott Holdings among whose shareholders are the Norwich Union, Barclays Bank, Prudential Assurance and the British Rail Pension Fund. Mr John Lelliott is chairman with David Deacon as managing director.

Other board members are Derek Bayliss, technical director; Edwin Bisset, financial director; and Peter Blackburn, business development director.
Reader Enquiry Service No. 33

Simon-Rosedowns sales network in North America

Simon-Rosedowns Ltd has finalised a marketing agreement with Crown Iron Works Company of Minneapolis, USA, under which Crown will promote the sales of the full range of Rosedowns oilseed screw presses to the North American market.

Simon-Rosedowns supply process technology and hardware for complete oilseed pre-treatment, oil extraction and refining systems. Recently the company has achieved success in North America with its 'G' type pre-press. Eight are currently in operation in the rapeseed growing belt of Canada and twelve have been supplied to the expanding sunflower region of North Dakota.
Reader Enquiry Service No. 34

Distributor agreement extended

Alfa Chemicals Ltd has announced that its distributor agreement with Societe Des Couleurs Zinciques, a Prayon subsidiary, has been extended.

The new products include zinc chromate to BS 389 and zinc phosphate to the European ISO specification. This extends the range already distributed: zinc tetraoxychromate, barium chromate and strontium chromate.
Reader Enquiry Service No. 35

Fishburn/Inmont license Oy Scanink AB

Fishburn Printing Ink Co. and its parent company, Inmont Corp., have agreed an arrangement with Oy Scanink AB of Finland, under which the Finnish company will manufacture Fishburn's range of liquid inks, excluding publication inks.

Apart from manufacture, the licence also gives Scanink exclusive responsibility for sales in Finland and the USSR and, ultimately, in Poland and Hungary. Additionally, Scanink has a non-exclusive licence for sales in Norway and Sweden.
Reader Enquiry Service No. 36

Prizes for "best papers"

The Birmingham Paint Varnish & Lacquer Club is offering two awards in 1982 (1st prize £100, 2nd prize £50). The awards are open to individuals employed in coatings related industries or those undergoing full or part-time education.

Awards will be made for the best papers submitted for contributions to the science or technology of surface coatings.
Reader Enquiry Service No. 37

new products

Self polishing copolymer antifouling paints

International Paint has announced the introduction of a family of self polishing copolymer antifouling paints, they are all designed to enable ship operators to save fuel, extend service and reduce maintenance costs. The ship operator is now able to select one to match particular ship operations, so maximising the savings obtained.

The benefits claimed for this new family arise mainly from two properties. Firstly, controlled biocide release which prevents marine growth. Secondly, prevention of hull roughness, a condition brought about by the degradation of the underwater hull in service.

Together, marine growth and hull roughness are responsible for increasing fuel consumption which can only be mitigated by drydocking the ship at frequent intervals for hull cleaning and repainting. The introduction of Intersmooth SPC makes a quantum jump in alleviating these conditions and is being increasingly specified worldwide. For instance, the hulls of more than 25 per cent of all large oil tankers are now coated with Intersmooth SPC.

Through its computerised product performance monitoring system: International Dataplan, International Paint has identified three key problem areas of

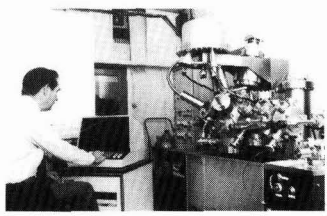
news

ship operation and has developed three coatings to meet them. They are:

(a) General trading and for vessels on deep sea routes particularly those of 2000 miles or more.

(b) For general trading. Low activity vessels, i.e. those operating on short sea routes with voyages of less than 2000 miles; those trading in severe fouling environments, e.g. Japanese waters, the Caribbean and Mediterranean; vessels trading at less than 10 knots.

(c) For operators requiring service for 36 months between drydockings
Reader Enquiry Service No. 38



International Paint's ESCA machine which is used to determine the precise chemical nature of the outer molecular layer of any surface

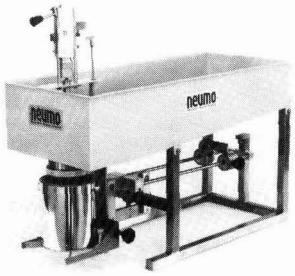
More Mistrons from CIL

Two more products have been added to the Mistron range marketed in the UK by Compounding Ingredients Ltd.

Mistron Cyprufil and Cyprusperse are pure magnesium aluminium silicates originating from the USA and characterised by their pure, platey nature. Careful control of particle size together with chemical purity and physical form has resulted in a range of very highly classified products with the following important characteristics, extremely low oil absorption, low water absorption, low viscosity in organic binders and binder solutions.

These properties allow Mistron Cyprufil and Cyprusperse to be used very successfully in the formulation of coatings with high solids contents, good flow out and good barrier properties. One application for which these products are ideally suited is in the formulation of emulsion systems where minimal wetting agent addition is advantageous.
Reader Enquiry Service No. 39

news



Semi-automatic filling machine

Semi-automatic filling machine

To meet demand for simple, accurate liquid filling equipment, Neumo has just developed a semi-automatic filler which requires no power supply and can be operated by unskilled labour.

Designed for filling 250 ml to 5 litre containers with non-foaming liquids and semi-liquids, the new machine (model SAF/28) is accurate up to ± 0.25 per cent and has filling speeds from 33 units per minute for 250 ml containers to 12 per minute for 5 litre containers.
Reader Enquiry Service No. 40

New liquid anti-settling agent

NL Chemicals has added a new liquid anti-settling agent to its well-known range of M-P-A products.

NL claim the new M-P-A 2000 X anti-settling agent provides major advantages for the user over existing paste products. It is pourable and pumpable and so is more easily handled and dispersed. These significant improvements, together with lower dosage rates, make M-P-A 2000 X anti-settling agent outstanding in cost effectiveness.
Reader Enquiry Service No. 41

Paint additives

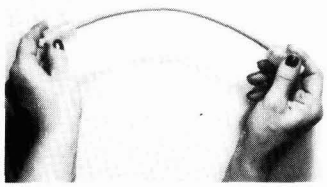
Byk-Mallinckrodt Chemical Products GmbH, has brought two new paint additives onto the market, claimed to improve coating surfaces.

Byk VP 341 is an additive for increasing the mar resistance and slip in solvent based and aqueous systems. An additional effect is the improvement of substrate wetting which considerably simplifies coating even on difficult substrates.

Byk VP 330 has been developed for organic coating systems. It is a flow and levelling additive which improves slip and has a stabilising effect on the surface. This is seen in the anti-crater effect when dust falls onto the surface. Moreover, Byk VP 330 causes insensitivity to draughts in wood varnishes, particularly in NC or modified acid-cured coatings. Byk VP 330 can also be used in the orientation of matting agents.
Reader Enquiry Service No. 42

Plastic IC columns

Faster analysis times, higher resolution and lower prices are claimed by Dionex (UK) Ltd as they upgrade their range of ion chromatographs with plastic columns. The unique inert plastic support contains new resins enabling up to 7 ions to be separated and identified in only 20 minutes. Resolution is also improved with narrower peaks which invariably return to the common baseline.
Reader Enquiry Service No. 43



Plastic columns for ion chromatographs

New wash valve and colorimeter

The new ChemLab mk.2 Reagent/Wash Valve is designed to reduce the amount of time it takes to wash through a continuous flow analysis system at the end of a period of analysis.

It is neater and more compact than previous valves and will operate for long periods with minimal attention. Once the reagent and wash lines have been connected it only requires a flick of a lever to change the system over from analysis to wash mode, or vice versa.

As agents for Brinkmann Instruments Inc., ChemLab Instruments Ltd, has announced the introduction of four new Dipping Probe Colorimeters. The Brinkmann Probe Colorimeters use a unique fibre optic light guide and detector system, together with a specially designed dipping probe which is inserted into the solution to be measured. Phase shifted, AC modulated light is transmitted to the probe tip and back to silicon detectors through an interference filter. This system enables measurements to be made without them being affected by extraneous or ambient light.

The diameter of the probe tip is less than 1 cm, so it can be easily inserted into a test tube and used to take a reading of a sample as small as 0.5 ml.

The Brinkmann Probe Colorimeters can also be adapted into flow-through cells whenever the colorimeter is required to measure the optical density of a continuous flow of sample.
Reader Enquiry Service No. 44

Two new Jaxa powder coatings

Sonneborn & Rieck Ltd has announced two entirely new powder coating materials in the 1981 Jaxa range. These are a low temperature/fast cure (LTFC) finish, and a texture finish. Both are available in a number of colours and in gloss, semi-gloss and semi-matt.

The LTFC powders enable manufacturers who use powder coatings to achieve significant energy saving in the curing process without loss of quality. The new texture finish is ideal for many applications in the electronics industry where wet finishes of this type have been used for many years.
Reader Enquiry Service No. 45

Europe's only "salt grinder"

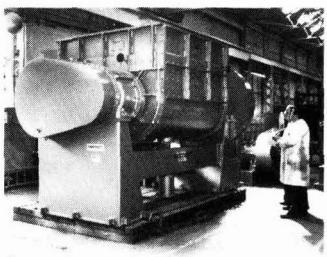
Baker Perkins have built a salt grinder which will be the only one of its kind in Europe when it is commissioned in a plant in the south of France.

The order was the result of close co-operation between three Baker Perkins group companies.

Baker Perkins Guittard of Chelles, France, won the order, Baker Perkins Inc. of Saginaw, USA, designed the machine and Baker Perkins Chemical Machinery Ltd of Stoke-on-Trent, UK, did the manufacturing.

The grinder will be used in the pigment industry and although it will be the only one of its type in Europe, the process is typical of American pigment production.

Salt suspended in glycol is used for grinding the pigment. The glycol acts as a viscosity adjustor, at the same time allowing power adjustment in the batch. In this way additions of glycol can be used to control the viscosity of the batch.
Reader Enquiry Service No. 46



The Baker Perkins salt grinder

literature

Custom chemical synthesis services in the UK

A new and unique guide to companies offering custom chemical manufacturing services in the UK has just been published by IAL-Industrial Aids Ltd.

Previous work by IAL-Industrial Aids Ltd on behalf of clients wishing to locate companies able to undertake custom synthesis and toll conversion has clearly shown that companies often have difficulty in determining the particular skills and activities of other manufacturers, and that there is a need for a published guide to such facilities in the UK.

The new guide brings together details of 47 companies or manufacturing sites in the UK providing custom chemical synthesis services on behalf of outside organisations. The aim of the authors has been to describe succintly, in the form of a standard profile, each company or manufacturing site in terms of the main groups of chemicals produced, and the various synthetic chemical techniques and ancillary processes in which the company claims to be particularly proficient. Details are given of each company's affiliations and the consequent access it may have to group research and development resources, the nature of the equipment it possesses and of the availability of site utilities and packaging and storage facilities. Brief extracts from published accounts are also given, where available.

The guide has been prepared to assist overseas and UK companies contemplating the use of custom manufacturing services, or seeking technical or commercial links with companies active in the UK (for instance through licensing or joint venture agreements), and to help them to identify the concerns best able to meet their needs.
Reader Enquiry Service No. 47

Books on chemistry

Chapman and Hall have produced a 16 page pamphlet containing details on over 80 books in the fields of physical chemistry, spectroscopy, organic chemistry, inorganic chemistry and chemical engineering.
Reader Enquiry Service No. 48

meetings, etc.

"Pressure-sensitive" technology

FINAT, the international federation representing manufacturers of pressure sensitive and heat-seal base materials and label converters, is sponsoring a two-day seminar on pressure-sensitive technology in Dusseldorf on 30 September and 1 October 1981. Further information is available from: The FINAT Secretariat, Laan Copes Van Cattenburch 79, NL-2585 EW The Hague, Holland.

Gas fluidisation

An intensive 4 day course on gas fluidisation, sponsored by the Institution of Chemical Engineers, will be held at the University of Bradford 21-24 September 1981. The lectures from industry and universities are all acknowledged experts in the field. Further details are available from: I. Chem. E., 12 Gayfere Street, London SW1P 3HP.

Fluid and suspension rheology

The Department of Industry's Warren Spring Laboratory is to hold a practical course on "Fluid Rheology" on 26-28 October, and a seminar on "Suspension Rheology" on 29 October 1981. Both events will take place at the Laboratory, at Stevenage. Further information is available from: Mr P J Kipping. Warren Spring Laboratory, PO Box 20, Gunnels Wood Road, Stevenage, Herts SG1 2BX Tel: 0438 3388.

news

Particle size analysing

A one week course on sampling, particle size analysis and surface area determination will be held at the University of Bradford from 7-11 September 1981. The course is intended for practising size analysts but will also be of interest to anyone considering setting up a size analysis laboratory. Further information is available from: The Secretary, School of Powder Technology, University of Bradford, Bradford, Yorkshire, England BD7 1DP, Tel: Bradford 33466 Ext. 380.

Chemicals in adhesives

A one day symposium entitled "Trends in the European market for chemicals in adhesives", organised by the Functional Chemicals Group of IMRA will be held on Thursday 5 November 1981 at the Cafe Royal, Regent Street, London. Further information is available from: Administrative Secretary, IMRA, 11 Bird Street, Lichfield, Staffs WS13 6PW.

Progress and Productivity in Coloration

The Society of Dyers and Colourists' 20th Biennial Symposium on "Progress and Productivity in Coloration" will be held on 23-26 September 1981 at Nottingham University. Further information is available from: The Editor, The Society of Dyers and Colourists, PO Box 244, Perkin House, Bradford, West Yorkshire BD1 2JB, England.

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

occa news

Manchester Section

Fifty-seventh Annual General Meeting

This year's Manchester Section. AGM was held on Friday 10 April 1981, as in previous years the venue was the Lancashire Cricket Club, Old Trafford, Manchester, it was attended by 72 members.

After receiving 10 apologies for absences Tony Jolly, the Section Chairman, opened the formal proceedings which were composed of 18 separate items and included the following:

Election of the new Chairman for 1981-83: Frank Redman of Crown Paints, Darwen.

Election of Vice-Chairman for 1981-83: Gordon Robson of ICI Pigments Division, Blackley.

Geoff Flood, Honorary Student Activities Secretary retired from committee due to his move to Paisley and Frank Arnold of the same company took over. The four vacant places on committee were filled by the election of John Calderbank, Frank Courtman, Fred Morpeth and Norman Piper. Ken Butcher, an Honorary Auditor for many

OCCA news

years retired from office and Bob Pascoe of ICI was his elected replacement. The subject of AOB included the Section's nomination of Colin Barker for a commendation award and Francis Smith, the President, gave details of his forward thinking group. The Chairman closed the meeting at 7.15 p.m.

Following the stampede to the bar, there was an excellent 3-course meal which terminated in a judicial degree of speech making during which Tony Jolly exchanged regalia with the new Chairman, Frank Redman, and handed over the celebrated Manchester OCCA "knocker".

The main entertainment of the evening was provided by Tommy Sutton who hails from Chemical City, alias Widnes, and whose repertoire of non-stop jokes was proof of the superiority of Merseyside area comedians. The only complaint heard was that his joke telling was so fast that the various writing instruments held in semi-inebriated hands, were no match in the quest to record the jokes for posterity.

The AGM was finally concluded with an outbreak of Manchester Section liar dice playing during which Francis Smith, aided and abetted by Sam Duckworth, was successful in recovering his previous losses to Manchester Section opponents, with interest!

F.B.W.

London Section

Kekwick prize

The Kekwick Prize, awarded annually to the most outstanding student studying a coatings course at the London Colleges, was jointly won by three students in 1980.

Ms F. Winch and Mr A. J. Wollard from the London College of Printing and Mr R. Rowland at East Ham College of Technology shared the prize and each received a cheque for £10 and one year's membership of OCCA.

A presentation was made to Mr Rowland at the London Section Annual General Meeting on 23 April 1981 at the Rubens Hotel by the Immediate Past Chairman, Dr T. A. Banfield. Ms Winch and Mr Wollard were unable to be present.

A.J.N.

Trent Valley Branch

AGM

The eighteenth Annual General Meeting of the Trent Valley Branch of the Midlands Section was held at the Cross Keys Inn, Turnditch, Derbyshire on Friday 10 April 1981, when the Honorary Officers elected were:

Chairman:
Mr J. E. Fowles-Smith
Vice-Chairman:
Mr J. R. Kitchen
Hon. Secretary:
Mr S. Watson
Hon. Treasurer:
Mr S. H. Codd
Hon. Social Secretary:
Mr C. V. White
Hon. Publications Officer:
Mr J. C. Ellis, and committee members Mr J. R. Tomlinson, Mr J. P. Bourne and Ms C. Morrell.

At the meeting it was announced that future meetings will be held at the Sutton Centre, Sutton-in-Ashfield.

The Chairman, Mr J. E. Fowles-Smith, whilst expressing disappointment at the small decline in membership was pleased to note that attendance at Trent Valley Branch technical meetings had increased during 1980-1981.

The business meeting was followed by the traditional buffet dance which was enjoyed by about 50 members, wives and guests, and during the evening Mr John Burns, Past Chairman of Midlands Section and Trent Valley Branch, to mark his retirement, was presented with an inscribed tankard by Mr C. V. White on behalf of the Trent Valley members and a gift was also presented to Mrs Burns by Mrs J. E. Fowles-Smith.

May they have a long and happy retirement.

J.C.E.

Obituary

Mr J. Smethurst

Jack Smethurst was proud of starting his career in 1934 in the technical service laboratory of Geigy Company's Pigments section, where he was an assistant in the Lake Laboratory. The interruptions of war service did not prevent him completing his Associateship of the Manchester College of Technology in 1948 but by this time, he was ready to demonstrate that he was a born salesman and by 1951 was appointed sales manager of the Pigments Division. He played a major part in increasing Geigy's rapidly developing pigments business and in 1958 was elected to the Board of James Anderson & Company (Colours) Limited, Geigy's manufacturing plant at Paisley in Scotland. At the reorganisation of the company into four operating divisions in 1965, he became the managing director of the Pigments Division of Geigy (UK) Limited. He was always striving "to build up a first class team of highly qualified people" whilst exploiting to the full his own marketing expertise.

Around that time, he described entertaining customers as one of his hobbies and it is in this context that he will be remembered affectionately by many. He was widely known in the British paint, printing ink and plastics industries and, earlier, in the paper industry. His fame as a raconteur and successful liar dice player (Manchester rules) will long be remembered. He was, at the same time, highly competitive and much respected in the organic pigments industry, serving as chairman of the British Colour Makers' Association in 1967.

A life-long active supporter of the Oil & Colour Chemists' Association, he not only took on official roles himself, but brought many others in and was the vehicle for providing his company's support. He served on the Manchester Section Committee for over 20 years and was Chairman from 1962 to 1964. On Council, he was an invigorating participant, having been not only a Vice-President and Section Representative, but three times an Elective Council Member, a position held at the time of his death. He particularly liked serving on the Finance Committee and could have become Honorary Treasurer and, ultimately, President, if his wife, Hilda's incapacity had not prevented her accompanying him on official occasions.

Following the merger between Ciba and Geigy in 1970, Jack Smethurst became managing director of the combined Pigments Division in the UK, and vigorously pursued his new responsibilities. His early retirement in 1974 after 40 years service, was brought about by a serious heart attack leading to open heart surgery, but his indomitable spirit did not let him take things easy. Several directorships and consultancies kept him very much a prominent figure in the industries he knew so well.

His elder daughter, Yvonne, was the reason for his active involvement with the Spastics Society, and he was one-time national chairman. He was a political being who gave local support to his party and tried to keep it on the very right lines. Despite this apparent extremism, he was a very kind-hearted person ready to give a helping hand at any time. He had also been a governor at two local schools.

His driving ambition was very much his desire to make adequate provision for his family and our sympathy is with them, and especially his wife and younger daughter, Valerie, and her husband.

The industry has lost an ebullient character who encouraged and motivated all those he came into contact with, and who brought a keen sense of real enjoyment in a job well done.

F. M. Smith

OCCA-33

GLITTERS AMONGST THE GLOOM

EXHIBITION REVIEW

Despite all talk of recessions and depressions, the OCCA 33rd Annual Exhibition, held for the second consecutive year at the Cunard International Hotel, Hammersmith, London, 28-30 April 1981, drew visitors from 37 countries and exhibitors from ten overseas countries. Many exhibitors who were new to OCCA Exhibitions were surprised at the number of worthwhile enquiries which they obtained and figures given below show the very high level of the attendance attracted to this annual forum for the surface coatings industries which can claim to be the leading exhibition of its kind in these industries.

The Association's achievement in mounting an exhibition during these difficult times, when many other exhibitions, some of direct interest to the industries have been postponed or severely curtailed, shows the very considerable pulling power of this unique Exhibition.

Exhibition Data Form

The Association completes the Exhibition Data Form certified by the Audit Bureau of Circulations (which conferred the distinction on the Association's Journal of the 1980 Reed International Award for the completion of the best media data form from a society or association – a truly prestigious achievement) and details which are being used in the completion of this year's Exhibition Data Form will be of interest to readers of this Journal; copies of the Exhibition Data Form should be available in August on application to the Association's offices.

Members of the Association's staff at the Information Centre. The scarves worn by these ladies is the newly introduced Association scarf in dark blue with the Association's motif in three colours at two corners. Many enquiries for membership, copies of the Association's publications etc. were received at the Information Centre on which was displayed the Reed International Award won by the Association's Journal in November 1980

Completion of the Exhibition Data Form, the attendance and details regarding exhibitors, has not only to be audited by the Association's auditors (Coopers & Lybrand), but analysed to the satisfaction of the Audit Bureau of Circulations and this naturally means that only the cards fully completed by visitors can be used for the purpose of analysing attendance by countries, job function and products manufactured. Readers will be pleased to learn that the visitors drawn from 37 countries on this occasion included, by description: directors, owners and management – 37%; section heads, chemists, technologists and technicians – 34% and sales and marketing 19%. Products manufactured by visitors, by percentage, included paint, coatings and inks 35%; resins 7%; pigments and dyes 9% and general chemicals 10%.

A delegation of Japanese scientists being greeted at the Information Centre by the Director & Secretary (Mr R. H. Hamblin) on the right

Although the Exhibition was smaller in stand area than in 1980, it is satisfying to note that the total number of exhibitors was 105 compared with 128, and that 28 of these were from overseas. The Exhibition was arranged on two floors of the hotel. A large direction sign was erected outside the hotel pointing to the registration desks where four commissionaires were in attendance and three large signs were erected in the foyer of the hotel, one directing visitors to the lifts for the third floor and the other two pointing to the registration desks; these, naturally, had the large OCCA motifs for the Exhibition specially designed by the Director & Secretary (Robert Hamblin) and the colours of the Exhibition were carried on the fascia felts around the stands and in the carpet in the New Hall. In addition, there were also signs on the third floor to guide visitors as they left the lifts. This year, a welcome innovation was a licenced refreshment area in the New Hall which was much appreciated by exhibitors and guests alike. Some exhibitors preferred to have rooms on the third floor only for exhibiting and entertaining, and other exhibitors had both stands in the New Hall and rooms on the third floor for carrying out more detailed discussions.

During the three days of the Exhibition, many exhibitors mentioned to the Association staff at the Information Centre that they had found considerable enthusiasm amongst visitors and that they wished to return for next year's Exhibition. The stands were again of a very high standard, light, spacious, informative and accessible. The hotel offered excellent facilities, including several restaurants and seating areas on the first floor where informal discussions could take place in a relaxed atmosphere.

OCCA-34

Preparations are now in hand for OCCA-34 which is scheduled to take place at the Cunard International Hotel on the 27, 28 and 29 April 1982 and copies of the Invitation to Exhibit will be sent to companies in the usual way towards the end of July for return in the autumn. Any companies which have not previously exhibited and wish to have a copy of the Invitation to Exhibit should write immediately to the Director & Secretary, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF, telex 922670 (OCCA G).

The following pages contain photographs taken at the Exhibition, together with information collated by the Honorary Editor of the Association, Mr D. S. Newton on his visits to the various stands.

Several exhibitors featured competitions on their stands. The winner of the competition shown on the above stand (Victor Wolf Ltd) was Mr R. K. Dobell of NL Chemicals whose guess of 7213 was closest to the number of beans in the jar, the actual number was 7209. He won the prize of a dozen bottles of wine

Two of the three large signs in the foyer, one pointing to the registration area and the other to the lifts for the exhibitors on the third floor

The Silberline Stand displaying their 1981 Queens Award to industry

Exhibition Report 1981

GLEN CRESTON MACHINERY LTD

A new Dyno-Mill designed to complete the range of this high efficiency horizontal bead mill, the Dyno Mill KD 110, having a 95 litre capacity was publicised as was the Turbula Laboratory size mixing pulsator. This is a high efficiency powder mixing mill, with high volume utilisation. Diaf high speed dissolvers were publicised, as was the Retsch Ultra Centrifugal Mill.

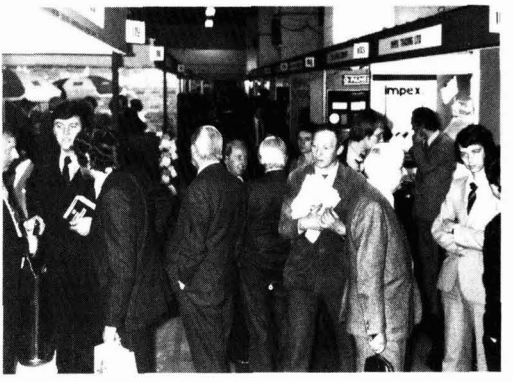
BOC AUTOMATION

This company exhibited the Hunterlab Interspec Color and Colour Difference Meter which employs detection systems with near retinal response. It conforms to the latest international specifications for colour measurement.

The Hunterlab D 541R Spectrophotometer has an extended range of 400-1100 nm, and the Combined Color and Gloss Meter was also displayed. This measures colour, colour difference, luminous reflection, contrast ratio whiteness, yellowness indices and ISO 2813 gloss.

The photograph shows the busy registration desk which were permanently manned by four commissionaires to help direct visitors both to the New Hall and to the third floor

The International Tin Research Institute, Stand 111



Also on show was the Hunterlab 500 Spectro Colormeter system. This is a programmable system with colorimetric scales from 10nm, spectral data, full scanning monochromator and duel illuminent system among other advantages.

ELCOMETER INSTRUMENTS LTD

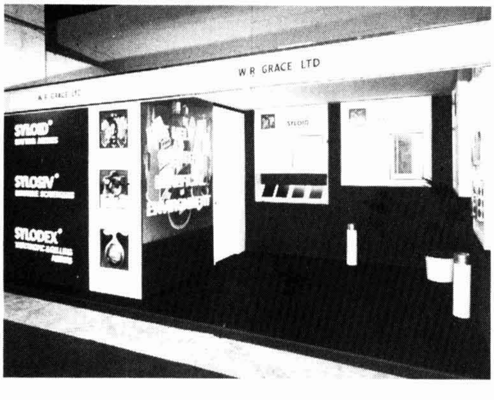
This company exhibited the wide range of quality control instruments including the 145 Surface Coating Thickness Gauge. This measures the thicknesses of non-magnetic coatings on ferrous substrates such as mild steel within the range 0-500 and 0-250 microns.

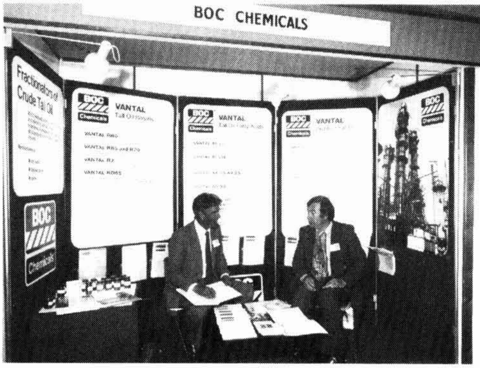
The breadth of instrumentation for film thickness measurement covered the range from the 101 Elcometer and 111 Inspector to the Digital 250 range.

The 200 Ultrasonic Wall Thickness Gauge was on view. This measures steel thicknesses within the range 1.5-99.9mm with a stated accuracy of 2.0 per cent.

A range of Gardner Laboratory's colour analysis instruments were exhibited, including the XL 805 Colorimeter which has many programmable features, including calibration and automatic colour difference with 10 temporary and 30 permanent memory locations. Two other instruments exhibited were the XL 825 and XL 865. The XL 825 Colorimeter System has the ability to measure colour on bulky objects using a 5 foot fibre optic cable. The XL 865 Circumferential Colorimeter System has a senser which provides circumferential illumination over a wide area and enables colour analyses to be performed on textiles, food, plastics, textured finishes and many other products.

This company also exhibited the well known range of Erichsen testing instruments, and the range of Leneta charts. The 195 Saberg drill for measuring the thickness of coatings on non-metallic substrates was also featured.



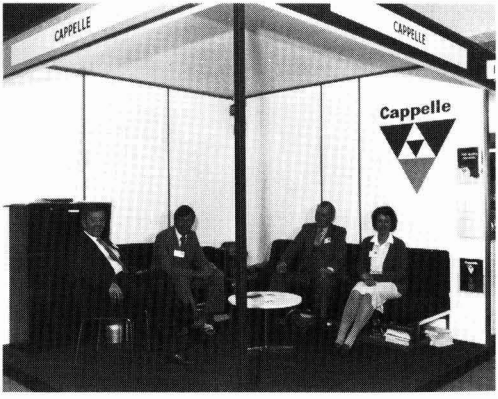


ELEKTRO-PHYSIK

The company exhibited their complete range of instruments for measuring the thickness of surface coatings on a metal substrate. New developments included the Certotest and the Pentest. The Certotest is a single scale portable electronic thickness gauge incorporating a hold device which retains the reading in order to improve accuracy of record.

A prototype of the new Minitest digital thickness meter for coatings on steel was displayed.

The company's range of Mikrotest and Minitest was also on show. Another new product, the 402 portable reflectometer was publicised.



MICRO PRODUCTS CO

In addition to the Micronised and Polyfluo ranges of waxes; Aqua Poly 250, Fluo HT2 and HTG2 were publicised. Aqua Poly 250 is a polyethylene wax modified for easy dispersion, optimum rub resistance, anti-blocking and slip properties. It is recommended for flexographic, packaging, gravure and publication gravure inks, as well as for aqueous coatings and industrial finishes.

Fluo HT2 and HTG2 are micronised PTFE polymers developed for excellent heat and rub resistance.

The range of Joncryl, Jonwax and Versacryl products were also shown. Emphasis was given to JC 1535, a metallic ink vehicle, Joncryl 678 and 61LV as chipping and grinding vehicles, and Versacryl APC 775 a new high solids board laquer.

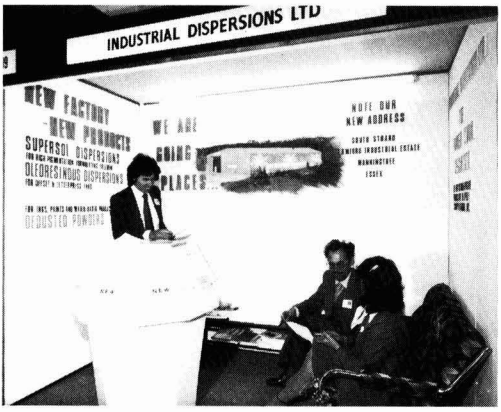
SARTORIUS INSTRUMENTS LTD

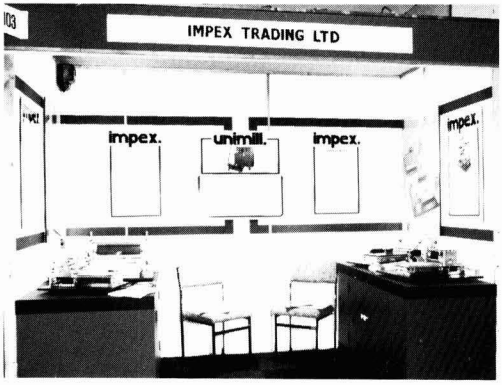
The company exhibited a selection of electronic, analytical and top-pan balances linked to a variety of data processing equipment. This range includes a 160g fully automatic semi-micro balance (2004MP6), the first analytical top-pan 160g by 0.0001g (1602MP6), and the latest development, a 30kg by 100mg (3808 MP).

Intermediate instruments such as the 1300MP6 of 4kg by 10mg were displayed.

A representative selection of Janke & Kunkel was displayed including the Rotary Evaporator, Ultra Turrax Homogeniser and Stirring motors, all with overload cut out switches.

Also exhibited was the Ret mixer designed to stir at a constant speed regardless of viscosity changes.

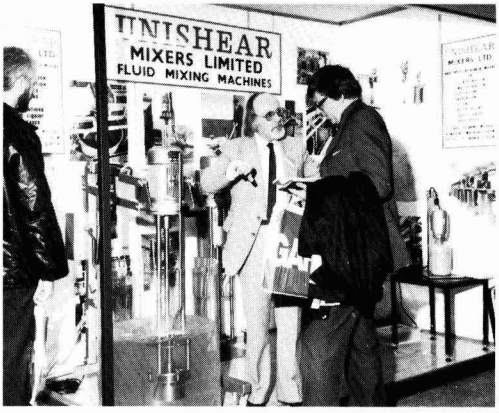




IMPEX TRADING LTD

This company exhibited its range of applicators for laying down a predetermined thickness of film with accuracy and reproducibility. They are available in a number of sizes, and units are designed for use in the paint, textile, paper and printing industries as well as for colour proofing. A rotary coater for the proofing of laminations, and printing onto continuous paper was also publicised.

The Unimill range of high throughput dispersion equipment was also described.



STRATFORD COLOURS LTD

This company exhibited their range of Fastachrome primrose, lemon, and middle chrome pigments, as well as the Scalachrome molybdate reds. Kromel signal and post office reds were also shown.

The range of corrosion inhibitive pigments manufactured by Waardels Kjemiske Fabrikker of Bergen Norway were also publicised, these comprise zinc phosphate to BS5193/1975, zinc chromate ZF and zinc tetroxychromate complying with BS 389, parts 2 and 3 respectively.

ROBAN ENGINEERING

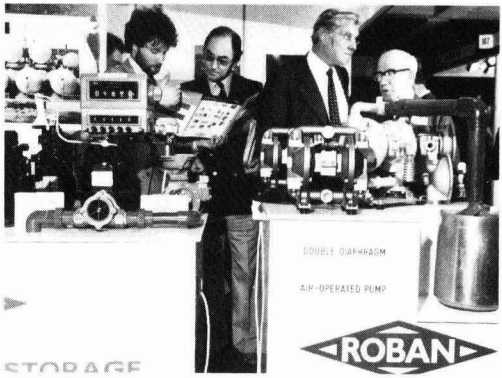
This company exhibitied the Roban double diaphragm air operated pump designed for abrasive slurries and viscous liquids. Also publicised was the Roban portable dispenser unit which is added to the bulk dispensing range of Roban products, these include the Roban R 300 pumps with Tokheim meters.

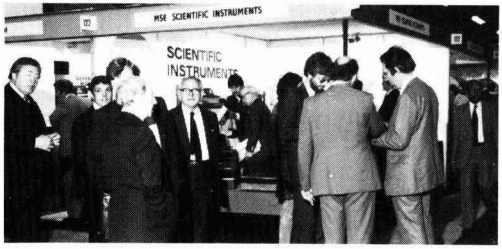
JOHN GODRICH

This company exhibited a new economy version of the "Credit" Humidity Cabinet RGH 81, conforming to BS 3900/F2 and ASTM specifications, and also the Liebisch range of salt spray and SO_2 cabinets. A condensation cabinet and water soak testing apparatus, both in the "Credit" range were shown.

Laboratory and works equipment on show included the Chemcol MS O-G mixer, and the Chemcol/Mirap range of machines, including hydraulic manual support systems. The new "Credit" Mix range of economical variable speed stirrers were also publicised.

Rotostat types X, XP and T were shown; the T type, used for processing high and low viscosity fluids, has rotating stators. The Rotojet axial jex mixer and Rapidex anchor stirrer were also available for inspection.





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

ABD EL-MALEK, MOUNIR MORCOS, PhD, MSc, National Research Centre, Dokki, Cairo, Egypt *(General Overseas)*

BOWMER, ALAN MILLIS, 19 Norman Road, Tutbury, Burton on Trent *(Midlands)*

DICK, STUART WILLIAM, BSc, AMES Ltd, PO Box ST 530, Southerton, Salisbury, Zimbabwe *(Zimbabwe – General Overseas)*

DONALDSON, BRIAN EDWARD, T. R. Chemicals (Scotland) Ltd, Phoenix House, Inchinnan Road, Paisley, Scotland *(Scottish)*

JENNINGS, LEONARD RAYMOND, LRSC, 55 Gloucester Road, Brookhouse, Walsall, West Midlands WA5 3PL *(Midlands)*

KENNEDY, JOHN, BSc, 29 Greenlands Court, Blenheim Road, Maidenhead, Berkshire *(Thames Valley)*

KOCH, WALTER, Apfelbergstrasse 28, 9430 St Margrethen, Switzerland *(General Overseas)*

KOREMAN, RICHARD PHILIP, 27-33 Lansford Crescent (Bayer NZ Ltd), Avondale, PO Box 2825, Auckland, New Zealand *(Auckland)*

KRIEL, RICHARD LOUIS, 26 Pauling Road, Suburbs, Bulawayo, Zimbabwe *(Zimbabwe – General Overseas)*

SUTHERLAND, DONALD IAN, BSc, 10 Triscombe Avenue, Highlands, Salisbury, Zimbabwe *(Zimbabwe – General Overseas)*

THEODOROU, CHRISTAKIS NICOLAOU, BSc, 45 Queen's Road, London N11 2QP *(London)*

TUNSTALL, DAVID ANTHONY, H. Haeffner & Co, Station Road, Chepstow, Gwent *(Bristol)*

UPFILL-BROWN, SIMON HERBERT, BSc, Plascon-Evans Paints (Tvl) Ltd, PO Box 3714, Johannesburg 2000, South Africa *(Transvaal)*

VAN DER WALT, LESLIE, Box 285, Bedfordview, Transvaal 2008, South Africa *(Transvaal)*

Associate Members

LEGGETT, ANTHONY WILLIAM, 23A Kindergarten Drive, Takanini, Auckland, New Zealand *(Auckland)*

NYAUNDI, GIVEMORE PHILIP, Sylvester & Kitchen (PYT) Ltd, PO Box 662, Salisbury, Zimbabwe *(Zimbabwe – General Overseas)*

QUICK, GARY PHILIP, Sylvester & Kitchen (PTY) Ltd, PO Box 662, Salisbury, Zimbabwe *(Zimbabwe – General Overseas)*

STURGEON, RICHARD JOHN, Waikato Industrial Paints Ltd, Box 5579, Frankton, New Zealand *(Auckland)*

TRINGHAM, JOHN MICHAEL, Box 84508, Greenside 2034, Johannesburg, South Africa *(Transvaal)*

OIL & COLOUR CHEMISTS' ASSOCIATION

Newcastle Section Symposium

ULTRAVIOLET POLYMERISATION AND THE SURFACE COATING INDUSTRIES

UV2 UV2

The eleven papers in this volume were originally published in *JOCCA* during 1978 and are based on lectures presented at the Second International Symposium of the Newcastle Section of the Association. Titles and authors are given below:

Exciplex interactions in photoinitiation of polymerisation by fluorenone amine systems *by A. Ledwith, J. A. Bosley and M. D. Purbrick*

Recent developments in photoinitiators *by G. Berner, R. Kirchmayr and G. Rist*

Present status of ultraviolet curable coatings technology in the United States *by J. Pelgrims*

The design and construction of ultraviolet lamp systems for the curing of coatings and inks *by R. E. Knight*

New developments in ultraviolet curable coatings technology *by C. B. Rybny and J. A. Vona*

Cure behaviour of photopolymer coatings *by R. Holman and H. Rubin*

Photoinitiator problems in clear coatings *by M. de Poortere, A Ducarme, P. Dufour and Y. Merck*

The UV curing of acrylate materials with high intensity flash *by R. Phillips*

Parameters in UV curable materials which influence cure speed *by A. van Neerbos*

The use of differential scanning calorimetry in photocuring studies *by A. C. Evans, C. Armstrong and R. J. Tolman*

The UV curing behaviour of some photoinitiators and photoactivators *by M. J. Davis, J. Doherty, A. A. Godfrey, P. N. Green, J. R. A. Young and M. A. Parrish*

Copies of **UV Polymerisation**, the first volume published by the Association on this subject, are available and may be purchased separately or at the specially reduced price if purchased together with a copy of *UV2*.

The two volumes together form the authorative work on the rapidly developing subject of ultraviolet polymerisation in the surface coatings industries. It is a work that no company in the field can afford to be without.

ORDER FORM

(Prepayment only)

To: **Oil & Colour Chemists' Association**,
Priory House, 967 Harrow Road,
Wembley, Middlesex HA0 2SF, England.

Please send me .... copies of Ultraviolet polymerisation 2 *(UV2)*

Please send me .... copies of Ultraviolet polymerisation *(UV1)*

I enclose remittance of £(US$) .... to cover the cost.

Name: _____

Address to which books should be sent:

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Price: Ultraviolet polymerisation 2 *(UV2)* £7.50 (US $18.00) each

Ultraviolet polymerisation 1 *(UV1)* £5.00 (US $12.00) each

UV1 and *UV2* purchased together £10.00 (US $24.00)

Prices include postage/packing (surface mail)

CLASSIFIED ADVERTISEMENTS

APPOINTMENTS

DREW AMEROID

Specialty Chemical Sales and Marketing (m/f)

Drew Ameroid International, a major multinational specialty performance chemical supplier, is intensifying and expanding its activities in additives for the paint, latex and non-woven industries. As a result of this expansion, new key positions in sales and marketing have been created, in several European countries. Performance in these positions will be highly challenging and success will be very visible throughout the corporation.

Candidates for sales positions must have at least 5 years' additive sales experience in this field. Candidates for marketing must have at least 10 years' sales/marketing experience in this field. All candidates must be strongly self-motivated and team oriented with substantial technical and commercial skills.

For sales, fluency in English plus language of assigned territory is required. For marketing, fluency in English and at least French or German is required.

Excellent compensation package is offered.

Reply in confidence under Box No. 501 to the newspaper, that will transmit.

SECOND-HAND EQUIPMENT FOR SALE

FOR SALE

Two used manganese steel lined ball mills – 470 gallon working capacity. Each mill is complete with 8 ton steel ball charge and is driven via 50HP FLP motor. These mills were manufactured in 1972 by Herbert Smith & Company (Grinding) Limited and are still in extremely good condition.

For further information, please contact:

Gestetner Stirling Limited, PO Box 19, Ladysneuk Road, Stirling FK9 5NW

Telephone Stirling (0786) 62611

LICENCE AVAILABLE

AVAILABLE FOR LICENCE

US manufacturer offers licence for the formulation of catalyzed, two-component, traffic safety paints having 99 per cent solids content by volume.

Please contact: **President, DeSantis Coatings Inc., 4580 Beidler Road, Box 160, Willoughby, OH, 44094, USA.**

SITUATIONS WANTED

QUALIFIED & EXPERIENCED PAINT CHEMIST

Qualified paint chemist (graduate, 29) with substantial experience in quality control, formulations, production, laboratory set-up, product development, colour match, technical service, etc. seeks a challenging position (UK), most locations considered, SE England preferred.

NB also experience of plastics, electroplating and teaching.

Please reply to **Box No. 500**

SENIOR POSITION REQUIRED

Hons. degree paint chemistry, LRIC, Professional Grade OCCA, 16 years experience surface coatings and pigment dispersions; senior R & D, quality control, technical service, works liaison, technical management. N. England preferred.

Please reply to **Box No. 499**

JOCCA

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For further information circle items listed below:

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

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Job Title . . . . . .

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Photocopy or cut out this form and send to:

Journal of the Oil and Colour Chemists' Association

Priory House, 967 Harrow Road, Wembley, Middx., HA0 2SF, England
Telephone: 01-908 1086 Telex: 922670 (OCCA G)

INDEX TO ADVERTISERS

Further information on any of the products advertised in this *Journal* may be obtained by circling the appropriate number on the *Reader Enquiry Service (RES)* form above. The *RES* numbers are shown in brackets below. Enquiries will be forwarded to the organisations concerned.

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