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Vol. 51 No. 7 July 1968

EUROPEAN CO-OPERATION LECTURE

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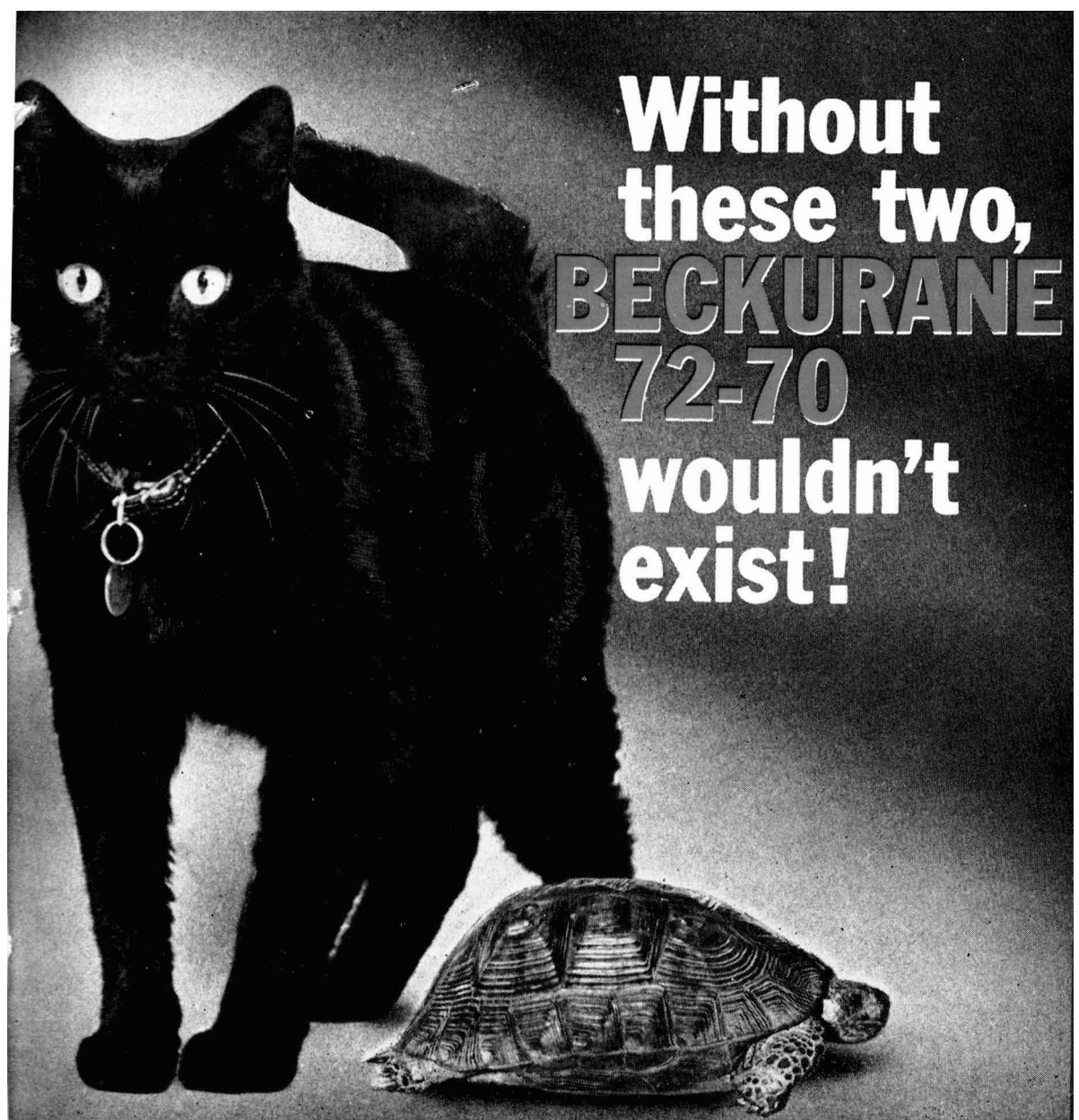

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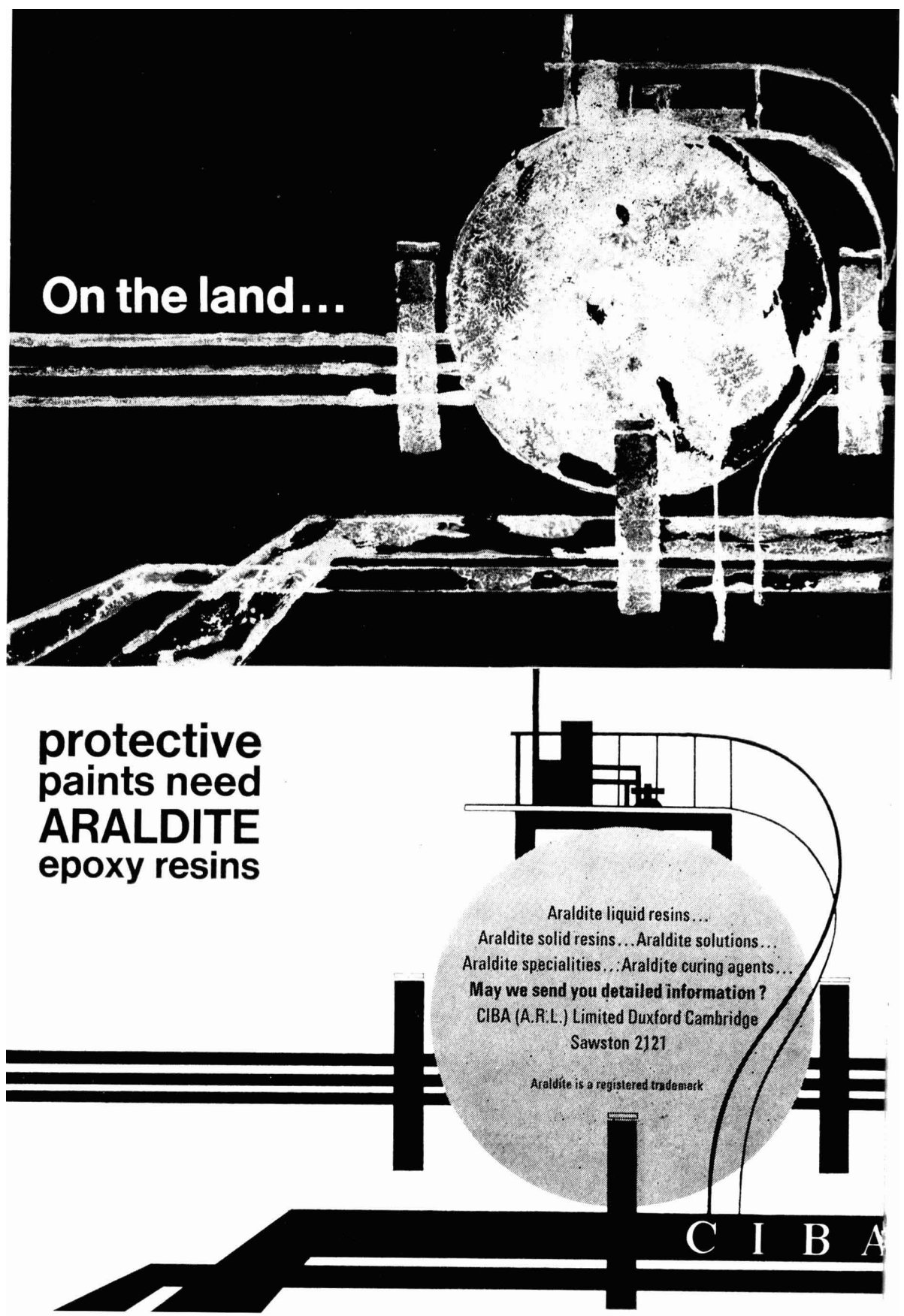
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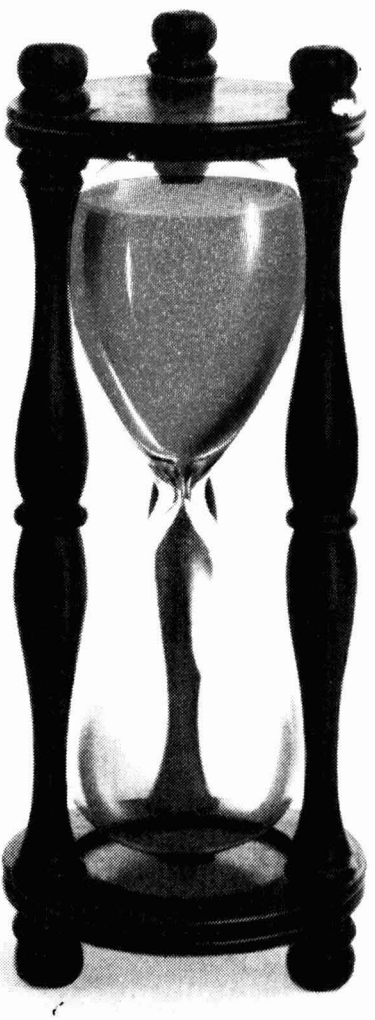

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European Co-operation Lecture

Co-operation—A necessity for paint and printing ink research*

By H. K. Raaschou Nielsen

Danish Paint and Ink Research Laboratory, Copenhagen, Denmark

Introduction

Co-operation, which according to the Concise Oxford Dictionary is defined as the act of working together to one end, became the keyword of this lecture as the natural result of my reflections on the co-operation between the London Section of the Oil and Colour Chemists' Association and the Danish Varnish and Paint Chemists' Association.

I should like to take this opportunity to mention one Englishman to whom I owe very much for the great inspiration he gave me during the early infancy of the Danish Paint and Ink Research Laboratory. I am thinking of Dr Jordan, one of your former presidents, who founded the Paint Research Station and who was its director for many years. In addition, he took the initiative in the foundation of the Organic Coatings Section of the IUPAC, the first organisation in which co-operation between chemists within the organic coatings field could take place on a truly international basis.

The reason why co-operation is of particular importance for paint and printing ink chemists is, of course, the great complexity of the products we deal with. Paint and printing ink are distinguished from most other industrially manufactured goods by not being finished products in the sense that the consumer understands this term when he thinks of, for instance, car tires, plastic rain coats, kitchen utensils, magazines, to mention only a few of the thousands of products the consumer uses in daily life, Thus, the properties of the product the consumer is interested in—the hardened paint film or the dried print—are dependent not only on the raw materials that go into the paint or the ink and the way in which the varnish is cooked and the pigment dispersed, but also on the type and condition of the substrate and, finally, on the manner in which the paint or ink is applied and the conditions under which it is left to dry. It is this complexity of our industry that makes it necessary for us to co-operate to the greatest possible extent with people and institutions who are able to assist us in solving specific problems.

When subsequently in my lecture I use the term paint and printing ink research I am not only thinking of that fundamental research without which our industry would have increasing difficulty competing with other industries,

*Presented to the London Section on 21 March 1968.

but I am using the term in the widest possible sense of the word. In the same manner, when discussing co-operation I shall try to touch upon most of the aspects of co-operation, whether it be national or international, through which the paint and printing ink industry may benefit.

The Danish paint and printing ink industry and the Central Research Laboratory

In order to make clear the very great importance I attach to co-operation in connection with paint and printing ink research, especially in a smaller country, it is necessary for me first to give you very briefly some idea of the size and structure of the Danish paint and printing ink industry and of the size, organisation and working programme of the Danish laboratory. It is my conviction, however, that many of the points to be raised are equally important for the industry in a larger country, such as Great Britain.

To start with some figures, I can inform you that Denmark has a population of somewhat more than 4.5 million inhabitants, which is approximately one tenth that of Great Britain, and that the paint and printing ink industry includes around 30 individual factories. The total turnover of the Danish factories last year amounted to approximately £19 million, but in addition paints and printing inks at a value which I estimate at £11 million were manufactured at 35 subsidiary plants in other countries. It is probably more characteristic of the Danish industry than of the British that paints and printing inks are often manufactured by the same plant: most factories of course make either paints or printing inks, but four of the largest Danish plants manufacture both products.

Compared to the Paint Research Station in Teddington, the Danish Paint and Ink Research Laboratory is small, with a staff of 13, of which four chemists and six laboratory assistants make up the technical staff. The council of the laboratory comprises five representatives from paint and printing ink factories, one from the Academy of Technical Sciences, with which the laboratory is affiliated, one from the Technical University of Copenhagen and one from the Danish Industrial Council. To give some idea of the activities of the laboratory, its objects clause, as taken from the statutes, is given in Table 1.

Table 1

Objects clause of the Danish Paint and Ink Research Laboratory

1. To work on research projects within the paint and printing ink fields.
2. To act as consultants for the Danish paint and printing ink industry and for larger consumers and groups of consumers of paints and printing inks.
3. To undertake investigations requisitioned by individual factories.
4. To procure and investigate apparatus and instruments of common interest to the industry and to place them at the disposal of the individual factories.
5. To act as a technical library and information centre for the industry.
6. To be instrumental in bringing about co-operation between the industry and technical and scientific institutions in and outside Denmark.
7. To take part in the education of chemical engineers and other technical people who wish to specialise in the industry.
8. To take part in technical public relations work for the industry.

In connection with the present lecture I shall mainly touch upon co-operation and its importance for the fields listed under

1. Research.
5. Information service.
6. Co-operation between industry and technical and scientific institutions.
7. Educational activities.

Aspects of co-operation

Co-operation with the member factories

Of prime importance for a central research laboratory closely connected with a specific industry, and for the industry itself, is, of course, co-operation with the member factories. As is probably the case with the majority of paint research institutes, this contact between industry and the research laboratory in Denmark is ensured through working committees, the members of which are responsible technical people from the industry. Because of the partially amalgamated structure of the Danish paint and printing ink industry, two working committees have been established, one for paints and another for printing inks, and these two bodies enjoy exactly the same status.

The close co-operation between chemists from the paint and the printing ink industry is very valuable, for a number of practical and theoretical problems are common to both industries. Many of the raw materials used are the same and, consequently, any effort made by a joint research laboratory for the development of analytical methods, and especially the adaptation of modern physical methods such as infrared spectroscopy, gas chromatography, and gel permeation chromatography, will be of interest to both industries. A more thorough knowledge of the solubility parameter concept, of the interactions taking place between pigments and vehicles, of rheology, and colour measurement, is also a necessity for both industries if they are to progress, and work done in such fields by a central laboratory, or in departments of universities through the initiative of the laboratory, will benefit the paint as well as the printing ink factories.

Co-operation between the Swedish and Danish Paint Research Laboratories

The Swedish and the Danish paint research laboratories are of approximately the same size and fairly small. For this reason an especially close and very valuable co-operation has been established between them, in order that the joint contribution to the paint industries in the two countries may be as effective as possible. Thus, the director of the Swedish laboratory, Mr Bengt Hemberg, receives all written material sent to the members of the working committee for paints by the Danish laboratory and generally takes part in meetings of the working committee in Copenhagen, and vice versa. This ensures the closest possible co-ordination of the working programmes of the two laboratories and prevents unnecessary duplication of work.

All research reports and technical memoranda from the two laboratories are sent to both the Swedish and the Danish members and any investigation requisitioned from a company in either country can be sent to that laboratory which is best equipped and qualified to carry out the particular investigation

and it will be treated in the same manner, whether it comes from one country or the other. In addition, the abstracting of articles from technical and scientific journals and of special reports is evenly divided among the members of the staffs of the two laboratories, and a joint Swedish/Danish monthly literature service is sent to all members and other subscribers in the two countries.

Co-operation within the industry in Western Europe

European Committee: The first step towards a closer technical co-operation among the European paint and printing ink industries was the founding in 1952 of the European Committee for Paint and Printing Ink Manufacturers Associations, the aim of which according to the statutes is to study all questions relating to the paint and printing ink industries, to take or recommend all measures concerning their development, to safeguard their interests both common and international, and to collect, exchange and circulate all relevant information. In 1958, the European Committee appointed a technical commission for printing inks and two years later technical commissions for harmonisation of test methods for paints and varnishes and for the study of European Corrosion Scales were founded.

So far, the work of the commission for printing inks has resulted in a CIE standard for the preparation of standard prints and ten standard methods for testing the fastness of prints to light, water, solvents, different chemicals, cheese and spices. Recently, a "European colour-scale for letterpress" has been published while a similar colour-scale for offset is scheduled for publication in October of this year.

The commission for the study of European corrosion scales has prepared a "European scale of degree of rusting for anticorrosive paints," based on a Swedish scale worked out by the Corrosion Committee of the Royal Swedish Academy of Technical Sciences. The possibility for standardising "European pictorial surface preparation standards for painting steel surfaces" on the basis of the Swedish SIS standard 05 59 00 has been discussed thoroughly in the commission since 1963. Because of the widespread dissemination the Swedish scale had already obtained outside Sweden, and because of the fact that several member countries had informed the commission that the contemplated European scale could not become a national standard in their respective countries, it was decided a year ago to discontinue this phase of the work in the commission. It was, however, decided that the European Committee could recommend the present Swedish pictorial standards.

Until a year ago, the commission for the harmonisation of testing paints and varnishes, under the chairmanship of Dr Cannegieter from Holland, had been very active, and had successfully prepared European standard methods for the determination of consistency by flow cup, degrees of drying, cross cut value, pendulum and pencil hardness values and flexibility by bending coated test panels over a mandrel. All these were published in 1964, and two years later two European standard methods for the determination of flash point were issued.

Meanwhile, in 1963 it had been decided by the Technical Committee ISO/TC 35 of the International Organisation for Standardisation to set up a subcommittee (ISO/TC 35/SC 9) for drawing up international draft recommenda-

tions for test methods for paints and their films. In order to avoid unnecessary duplication of work it was, therefore, decided by the European Committee to stop active work within the harmonisation commission. Since several members of this commission, however, are also members of the ISO-sub-committee, the necessary co-operation between manufacturers and the International Organisation for Standardisation is still ensured.

National Research Laboratories: The possibility of a closer co-operation between the national paint research laboratories in Western Europe has been discussed on several occasions and in the autumn of 1965 an informal meeting was arranged between the directors of seven laboratories at the Verfinstituut TNO in Delft on the initiative of the then director of the Dutch Research Laboratory, Dr Talen. It was quite clear from the discussions that many of the same important fundamental and practical problems were being dealt with in several of the laboratories represented and that in many fields of activity duplication of work could be avoided through closer co-operation. It was, however, just as evident that there are very essential differences in the laboratories as to size, organisation, working programmes and publication policy, and that the work in the different laboratories, although there may be similarities, is not necessarily directed towards exactly the same objectives, except in a general sense.

It is quite clear that a closer co-operation must not interfere with the working of the several laboratories nor with the development of their individual ideas and research efforts. Nonetheless, through the discussions carried out by the directors of research at their meetings, complementary work on the same problems can be checked and the efficacy and accuracy of the work be thereby increased. In selected areas of research, usage of the same materials should also be possible, and although the working methods may differ, the laboratories should be able to compare the results more readily and thereby mutually enhance the value of the work. Some progress has been made along these lines, and, at present, investigations of the glass transition temperature of organic coating films and of the durability of paint systems in different climates are being carried out through co-operation between the national paint research laboratories.

Wider international co-operation

While the international co-operation so far discussed is only international in a limited sense of the word, in as much as the work in the European Committee and the co-operation between the directors of paint research institutes involves only Western European countries, co-operation on a wider geographical scale is also taking place.

The Organic Coatings Section of the Applied Chemistry Division of IUPAC, the international Union of Pure and Applied Chemistry is a truly international forum for chemists from the paint industry. It was founded in 1951, on the initiative of Dr Jordan, for the purpose of establishing an organisation in which the scientific background of technological problems pertaining to the paint industry could be discussed on a high level and on a wide international basis. At present, only Western European countries and the United States are represented in the Organic Coatings Section. At a meeting of the section in Prague last autumn, however, it was decided that, in future, much more emphasis

should be attached to extending the membership in the Organic Coatings Section to paint chemists from Eastern Europe and other countries so far not represented in the section. From perusal of the Russian literature it is my impression that many theoretical and practical problems are treated from different points of view here and in Russia—and probably also in other Eastern European countries —and a more direct contact will unquestionably be beneficial for both parties.

The main factor limiting the activities of the Organic Coatings Section is, of course, that the members, like all chemists in the paint industry, are very busy people who have to economise carefully with their time. Nevertheless, reports on "Hardness testing of organic coatings" and "Recommended methods for the analysis of drying oils" have been published recently by the Organic Coatings Section in the IUPAC journal "Pure and Applied Chemistry."

The subjects presently dealt with in the OCS are listed in Table 2.

Table 2

Present Organic Coatings Section Projects

1. Adhesion testing of organic coatings.
2. Rheological properties of liquid paints.
3. Recommended methods for the analysis of alkyd resins.
4. Advanced training for chemists employed in the paint industry.

The Technical Committee ISO/TC 35 of the International Organisation for Standardisation is another truly international forum working with technical paint problems. It was originally set up almost 20 years ago for the purpose of preparing draft recommendations for specifications and methods of test for raw materials for paint. This committee met twice, in 1950 and 1953, under the chairmanship of the late Dr Kappelmeier, but after his death the work progressed very slowly. Ten years later it was decided to include finished paints and their films on the working programme of ISO/TC 35 and a new sub-committee, ISO/TC 35/SC 9, was set up with the British Standards Institution as its secretariat. In this connection, I will only say that a very impressive amount of work has been carried out in this sub-committee in a short span of time thanks to the exemplary activities of the British secretariat. The work of the International Organisation for Standardisation is of course especially valuable for a smaller country which could not alone carry out such a great amount of work. On the other hand, we do feel that we have been able to contribute actively in a modest way to the progress of some of the test methods that are on the programme of sub-committee 9.

Co-operation with universities and technical colleges

So far I have only talked about co-operation within the paint and printing ink industry, but there are many other types of co-operation through which our industry can benefit. Close co-operation with the departments of universities and technical colleges is very important, for it has not one, but three different aspects. It opens the possibilities, first of introducing special paint and printing ink courses into the curricula of the institutions, secondly of arranging advanced training courses in specific fields of interest to chemists already employed in the industry, and thirdly of establishing the close contact necessary for solving the

more theoretical problems that require experience and equipment not available in paint and printing ink research laboratories.

In Denmark this co-operation is extremely close. The Assistant Professor in Polymer Technology at the Institute of Chemical Industries of the Technical University of Denmark is a member of the board of the Danish Paint and Ink Research Laboratory and *a special course in paint and printing ink chemistry and technology* is given in the eighth semester for chemical engineering students wishing to major in this subject. This course comprises a lecture series, given by the director and staff members of the laboratory, and 200 hours of experimental work in the laboratory. The purpose of the experimental work is to give the students an opportunity to solve independent research problems within the paint and printing ink field and, on completion of the course, a thesis is submitted. Typical research problems that have been dealt with by chemical engineering students in the Paint and Ink Laboratory in Copenhagen during the last few years are listed in Table 3.

Table 3

Typical research problems dealt with by chemical engineering students

Investigation of the applicability of gel permeation chromatography for determining the molecular weight distribution in linear polyesters.
Investigation of the conformation of polymers in solution by light scattering.
Determination of the three-dimensional solubility parameter sphere by computer.
Investigation of binder adsorption on pigment surfaces.
Co-polymerisation of vinyl acetate and vinyl esters of branched C_9-C_{11} acids.
Preparation of water soluble epoxy ester resins.
Electron beam curing of unsaturated polyester lacquers.
Investigation of the influence of the rheological properties of letterpress inks on ink transfer.

The undergraduate work may be supplemented by graduate work in paint and printing ink chemistry leading either to the degree of technical licentiate or to a doctor's degree. Such work is the direct responsibility of the Dean of the Institute of Chemical Industries, but the actual experimental work is usually carried out in the Paint and Ink Research Laboratory.

The advantages of this co-operation with the Institute of Chemical Industries is threefold: the students benefit in their work by the experience of the laboratory staff and the specialised equipment available in the laboratory; the industry has the advantage of being in a position to employ chemists who, on graduating, have some basic paint and printing ink knowledge and who have worked on a research problem within this field; and the laboratory gains by being able to recommend to the students that they choose as their research projects such subjects as fall within the general research programme of the laboratory.

Of the 86 graduates who have taken the course in paint and printing ink chemistry and technology at the Danish laboratory, 40 were directly employed in paint and printing ink factories after graduating, while 13 went into industries which either manufacture raw materials for the industry or are consumers of paints or printing inks. This is one important reason why the industry in Denmark is very interested in a close co-operation between the Technical University and the Research Laboratory.

Advanced training: With the steadily increasing development of our industry, as well as the industries with which it is connected, and of the fundamental sciences on which it is based, the question of advanced and other supplementary training of technical personnel already engaged in industry becomes more important year by year. Advanced training in the fundamental sciences must be the responsibility of the universities and technical colleges, and co-operation between them and our industry is also, for this reason, of paramount importance. As an example I can mention that, at present, a course is being given in the department of physical chemistry at the Technical University of Copenhagen on "Interfacial and macromolecular chemistry," a subject which is certainly of interest to many chemists in the paint and printing ink industry.

Basic research: The third aspect of the co-operation with universities and technical colleges is of particular importance to a small research institute, such as the Danish Laboratory, that has neither the personnel nor all the equipment necessary for tackling many of the important basic problems of our industry. Through close contact with the staff of the Institute of Chemical Industries, for example, we have the possibility of working on research problems that require modern equipment for polymer research such as an Instron tester, a Waters gel permeation chromatograph, membrane and vapour pressure osmometers, as well as a sorptometer for determining the specific surface of pigments. Similar contacts have been established with physical chemistry departments and other divisions of universities and colleges.

The Solubility Parameter Concept: A very typical subject worthy of much greater co-operation between physical chemistry departments at universities and the paint and printing ink industry, national as well as international, is the very topical question of utilising the solubility parameter concept for the solving of practical formulation problems within our industry. As is well known, the solubility parameter concept was originally introduced to our industry more than 12 years ago by Harry Burrell, who, by the way, is going to receive the American Chemical Society "Award in the Chemistry of Plastics and Coatings" for his pioneering work in this field at the San Francisco meeting of the ACS in a few weeks. Since its introduction, several modified solubility parameter systems have appeared and, today, the situation is highly confusing, to put it mildly.

A considerable amount of work has been carried out in the Danish Paint and Ink Research Laboratory during the last four years by Charles M. Hansen as an essential part of the studies for which he obtained his doctor's degree from the Technical University. Time does not allow me to go into details regarding this work, parts of which were published last year in the Journal of Paint Technology. The basis of Hansen's three dimensional solubility parameter concept is the assumption that the energy of evaporation, i.e. the total cohesive energy which holds a liquid together, can be divided in contributions from dispersion (London) forces, polar forces and hydrogen-bonding forces, and that the total solubility parameter δ_t of a given solvent can be considered a vector with the components δ_d, δ_p and δ_h, corresponding to these three forces. Solvents may be placed as points in the three-dimensional system, and polymers as coherent volumes of solubility within which those solvents that dissolve a given polymer are placed.

The present confusion mentioned above is apparent from Table 4, in which is given a survey of the different modifications of the solubility parameter system known today and an indication of manufacturers who use solubility parameters as part of the information given in their sales literature.

Table 4
List of solubility parameter systems

Company	Solubility parameters	Originator
Hercules Powder Company	δ_t, 3 HBP levels	Burrell
E. I. DuPont de Nemours Pennsylvania Ind. Chem. Co.	δ_t, quantified HBP values	Burrell, Liebermann
Köge Chemical Works	δ_t, γ	Burrell, Crowley et al.
Eastman Chem. Products Cray Valley Products Ltd.	δ_t, γ, μ	Crowley et al.
Danish Paint and Ink Lab.	δ_d, δ_p, δ_h	Hansen

δ_t : total solubility parameter
δ_d: dispersion component of δ_t
δ_p: polar component of δ_t
δ_h: hydrogen bonding component of δ_t

HBP: hydrogen bonding parameter
μ : dipole moment
γ : hydrogen bonding

I feel convinced that, as the paint and printing ink chemists become more used to thinking in terms of solubility parameters and start really using this concept in connection with practical formulation problems, it will not take many years before most manufacturers of solvents and binders will have to give information in their specifications about the solubility parameters of their products. A necessary condition for a more general use is, however, that the widest possible agreement be reached as to the most suitable system to be used in practice. It should be based on sound theoretical principles and be convenient for the paint and printing ink formulator to use, if these two demands can be fulfilled simultaneously, and this aim can only be reached through close co-operation between the formulators and the physical chemists.

Co-operation with the raw material manufacturers

There is no doubt that much of the fundamental research and development work on which our industry is based is carried out in the laboratories of the raw material manufacturers and, therefore, a close co-operation with them is very important. This co-operation is, however, ensured in a satisfactory way through the initiative of the raw material manufacturers, and there is at present no need to concern ourselves further with this field.

Co-operation with consumers

It is interesting to note that the first attempt at co-operation in the paint field in Denmark was started by the paint consumers, in that the master painters' organisation, more than 50 years ago, in 1917, took the initiative to establish a testing station at the Technological Institute in Copenhagen. The direct reason for this was the shortage of suitable painting materials and the abundance of more or less usable substitutes during the war years. The first co-operative experimental work in Denmark—an extensive comparison of the outdoor

durability of paints made with different white pigments—was also carried out on the initiative of the testing station in the late 'twenties when a large part of the painting materials used by the painters was personally mixed from pigments in oil, boiled linseed oil, driers and turpentine or white spirit.

Today the most important activities of the Department for Paints and Industrial Finishing of the Technological Institute (as it is called today) are consultations and educational activities in connection with painting and industrial finishing, including metallisation and chemical surface treatment. These activities are not only for the benefit of the master painters and the paint consuming industries, but also for the benefit of technical and sales personnel of the paint factories, as well as for architects, consulting engineers and others who, in their commercial activities in this field, need advice. As a necessary supplement to these activities, investigation of newer painting materials as well as development work in connection with the utilisation of newer apparatus and techniques for application is carried out.

The Department for Paints and Industrial Finishing at the Technological Institute has in recent years, under the slogan "Better painting," in close co-operation with the paint industry and contractors, made a very valuable contribution in which the consumer has always been taken into special consideration.

Co-operation through the paint and varnish chemists' associations

The prime purpose of the national paint and varnish chemists' association is to arrange meetings at which lectures are given, but, of course, other activities, through which a more active co-operation of the members can be realised, are possible. Without disparaging anyone I think it is fair to say that the co-operative activities of the individual Societies for Paint Technology of the American Federation are splendid examples from which we in Europe have a lot to learn. I realise that it is difficult to compare the situation in the United States, where there is no Paint Research Station or Verfinstituut, with the European situation, and I also know that similar activities have at times been accomplished through individual sections of OCCA. I am not certain, however, that further activities on the part of the European associations could not be carried through to the mutual benefit of the members participating and, thereby, to the advantage of the industry.

The question of furthering the activities of the Danish association has recently been seriously considered, and it was decided as a first attempt to arrange a study group for the purpose of discussing the possibilities of practical utilisation of the solubility parameter system. The study group, which was arranged on three Saturdays, proved to be a great success, and, at the concluding session the participants agreed to work actively along lines decided upon during the meetings of the group and to meet again next autumn to continue the co-operative work on the basis of the experience gained during the intervening time.

Co-operation through the technical literature

The type of co-operation which paint chemists most frequently use, even though they seldom think of it as such, is the indirect or direct co-operation they have with authors of articles or other kinds of reports perused in connection with the solving of a specific problem. Usually this co-operation is indirect, but I have

personally, in connection with literature studies, come into contact on several occasions with colleagues in other countries, even in Russia and Japan, and I believe that this kind of co-operation could be utilised far more than it is today.

The problem of the technical literature has been brought up in connection with the key word of my lecture—co-operation—for another reason. There can be no doubt that much of the very valuable information available to all paint chemists through the technical literature is used far too infrequently. To assist chemists in keeping informed about technical literature, much valuable work is being done in the form of national literature services of one kind or another. The service that is most widely used all over the world is undoubtedly the Review of Current Literature compiled by members of the Paint Research Station at Teddington. Other literature services are, however, provided by the Scientific Section of the National Paint, Varnish and Lacquer Association in Washington, the Verfinstituut TNO in Holland, the French Research Laboratory in Thais near Paris, the Swedish and the Danish Paint Research Laboratories and, probably, by several other organisations.

This problem has been attacked very differently in the various countries, but the fact remains that the same articles are being abstracted at the same time by very busy paint chemists in many different places in the world. This work is going to be more and more extensive in the future, and it is a serious question whether or not the national laboratories will continue to be able to afford this duplication of work in ten or 20 years' time. This is one sphere of work where extensive co-operation would be of great benefit.

It might seem natural for the paint industries in two of the smaller European countries, Sweden and Denmark, to be satisfied with the Review. A great number of the paint factories in Scandinavia do subscribe to it and would not be without it because of its very complete coverage of the paint field and the excellent yearly indices, which facilitate literature searches immensely. It is, however, considered a drawback in some countries that the individual abstracts are not classified in such a way that they can be properly filed away, and re-located when required. For this reason, the need for a supplementary literature service was felt in Sweden and Denmark. Since the Swedish/Danish literature service is a good example of co-operation between laboratories in two different countries, and because of some essential differences between this service and the British literature service in the Review, a brief account of it will be given.

When the Swedish/Danish literature service was originally planned, it was, for the reasons stated above, taken for granted that the abstracts should be classified, and the possible use of the Universal Decimal Classification (UDC) system was very carefully considered. A very commendable effort had been done at the Verfinstituut in Holland in bringing the UDC group for paints (667.6) up to date, and the sub-division of this group in the last German issue (1965) of the main UDC division 66, which includes chemical industry and technology, is based mainly on the system worked out by the Verfinstituut. This system is presently being used for classifying in Verfkroniek, in the Russian paint journal "Paint Materials and their Application" and in the Japanese journal "Colour materials." Nonetheless, in Sweden and Denmark the UDC classification system was found to be too inflexible and too cumbersome to work with in practice.

Instead, it was agreed to base the literature service on a Swedish classification system which had been used successfully for a number of years. In Table 5, the main 17 groups of this system are listed. They are designated by letters, while numbers are used for further sub-groupings. As an example of this, the designations for the various alkyd resin groups are shown in Table 6. Individual groups may be combined in two different ways. To avoid too extensive sub-division of the groups, two or more groups may be combined by a dash. An unpigmented chlorinated rubber lacquer is thus designated M 421-J 62 by combining M 421 (clear varnishes) with J 62 (chlorinated rubber). Furthermore, if an article has to be filed two or more places, the corresponding groups are combined with points. M 872.D 417 thus stands for abrasion resistance of traffic paints, indicating that the article has to be filed under abrasion resistance (D 417) and traffic paints (M 872). Fig 1 shows examples of the literature cards sent out to the members.

Table 5

Scandinavian classification system, main groups

A	Documentation and organisation.
B	Sciences (excluding chemistry)
C	Chemistry.
D	Physical and chemical properties.
	D1. Structure.
	D2. Optical and acoustical properties.
	D3. Electrical and magnetic properties.
	D4. Mechanical properties.
	D5. Thermal properties.
	D6. Rheological properties.
	D7. Behaviour on external influence.
E	Chemicals.
F	Pigments, dyes and extenders.
G	Oils, fats and fatty acids.
H	Resins, including bitumen and tar.
J	Polymers.
	J1. Condensation polymers.
	J3. Addition polymers.
	J5-J9. Polymers derived from natural products.
K	Solvents and plasticisers.
L	Additives.
M	Paints and varnishes.
	M1. Paints and varnishes for different applications.
	M4. Paints and varnishes of different types.
	M6-M7. Special paints and varnishes.
P	Surface preparation and application methods.
	P1. Surface preparation.
	P2. Application methods.
	P3. Painting of different substrates.
	P4. Laminating, enamelling and metal coating.
	P5. Drying.
	P6. Special techniques.
	P7. Glueing.
	P8. Defects.
R	Fabrication.
T	Filling and packing.
U	Equipment for factories, offices and laboratories.
Z	Economies and industrial organisation.

Table 6

Scandinavian classification system, example of sub-division

J	Polymers		
	J0	General	
	J1	Condensation polymers	
		J 14	Alkyd resins, maleic resins
			J 140 General
			J 141 Alkyd resins, un-modified
			J 142 — J 143 Alkyd resins, modified
			J 1420 General
			J 1421 Drying alkyd resins, modified with fatty acids and other monocarboxylic acids
			J 1422 Non-drying alkyd resins, modified with fatty acids and other monocarboxylic acids
			J 1423 Alkyd resins, modified with fatty acids and natural resins
			J 1424 Alkyd resins, modified with fatty acids and phenolic resins
			J 1425 Alkyd resins, modified with fatty acids and silicones
			J 1426 Alkyd resins, modified with fatty acids and other resins
			J 1431 Alkyd resins, modified with fatty acids and vinyl monomers
			J 1433 Alkyd resins, modified with fatty acids and cyclopentadiene
			J 1439 Miscellaneous
		J 145	Unsaturated polyesters
		J 146	Maleic resins
		J 149	Miscellaneous

Fig. 1. Scandinavian classification system, literature cards

L—D 6112 — F 343 . M 47 — D 6112

TAYLOR, J. & NEUMANN, B.S.: The nature of synthetic swelling clays and their use in emulsion paints.—
JOCCA, **51** (1968): 3, 232-253.

The synthesis of swelling clays (Laponite, Laporte Ind. Ltd.) and their chemical, physical and rheological properties are described. The application of these materials as gelling agents for emulsion paints is discussed and the interaction with other common ingredients of such paints is studied.

9 fig. 8 tab. 8 ref.

Classification groups used:

L	Additives
D 6112	Structural viscosity, thixotropy
F 343	Clays
M 47	Emulsion paints

M 46 — J 153 . P 24 — D 31

VAN WESTRENEN, W. J. & TYSALL, L. A. Some aspects of the preparation and testing of recently developed water-soluble epoxy ester resins.—JOCCA, **51** (1968): 2, 108-136.

Short oil epoxy esters are reacted with mono-anhydrides to form half esters which become water-soluble after addition of a coupling agent and an amine. The effect of possible variations are indicated. Laboratory methods including determination of rupture voltage and throwing power as well as continuous circulation and deposition tests are described. It is concluded that the technique is a promising lead in the development of aqueous epoxy ester systems to be applied by electrodeposition.

13 fig. 10 tab. 4 ref.

Classification groups used:

M 46	Water soluble paints
J 153	Epoxy esters
P 24	Application by dipping
D 31	Electric properties
(P 24 — D 31	Electrodeposition)

It has already been mentioned that the abstracting of articles is evenly divided between the Swedish and the Danish laboratories and that the final literature service is sent as a joint publication in the form of cards to all members and other subscribers. It might, furthermore, be added that some factories use the Swedish system not only for filing the literature cards, but also for classifying technical material (received from manufacturers of raw materials and machinery used in the manufacture of paints and printing inks). If the salary (with overheads) corresponding to the time used by the technical staff for abstracting is included, the total cost of preparing the Swedish/Danish literature service amounts to approximately £6,000 a year for the two laboratories combined. I shall not conceal the fact that some Danish factories consider this amount too great to be justified, even though it is only half of what it would have been, were it not for the co-operation between the two laboratories.

A broader international co-operation within this field is a thought that immediately presents itself. On the basis of the "Paint thesaurus" which is at present being prepared by the Federation of Societies for Paint Technology, and taking the modern methods of literature retrieval and the existing classification systems into account, it would undoubtedly be possible to work out an international paint literature service that would make any of the existing literature services superfluous. There will be many problems to be solved: How can the abstracting be divided among the different nations and according to which principle can it be carried out? How can an ideal classification system be worked out and how can we keep it up to date? Will it be necessary, initially, to prepare an international literature service in any other language than English,

which will certainly suffice in Great Britain, the United States and Canada, Australia, the Scandinavian countries, Holland and possibly elsewhere? I can offer no patent solution at present, but I do know that much experience is available in many countries, and I am convinced that international co-operation within this field can be of such great importance for our industry in the future, that it should be very carefully considered.

Conclusion

In concluding this talk, I should like to emphasise that, while the paint and printing ink industry has progressed rapidly, scientifically as well as technologically during the last 20 years—just as most other chemical industries (and among these, those with which our industry must compete)—still, for every problem solved, new ones seem to appear that have to be solved. The paint and printing ink industry is unusually complex and tied up with an exceptional number of fundamental sciences and varied industries; the solving of the multiplicity of problems arising thereof as quickly and economically as possible makes it especially necessary that we co-operate with scientific and technical people outside as well as inside our industry. This is, of course, no bright new discovery of mine, and I have already during my talk mentioned that co-operation does take place on an international level in the Organic Coatings Section of the IUPAC, the International Standardization Organization, the European Committee, and between the directors of European Paint Research Institutes. Today's co-operation is, however, in my opinion, only a vague shadow of the co-operation of tomorrow, for without a vastly increased, national and international co-operation—taken in the widest sense of the word—it will not be possible for our industry to solve all the present and future problems which must be solved if it is to survive as a competitive, progressive industry.

[*Received 28 March 1968*

Discussion at London Section

DR L. VALENTINE said that two points in particular stood out for him in this most interesting lecture. Firstly, his strong support for the need to consider further ways and means of dealing with the information problem, which became more difficult each year for industrial companies. This was due to an overall increase in publications, and also because of the various systems of data classification and retrieval that were being developed.

Secondly, the Danish laboratory should regard the small size of its industry as an advantage, rather than a disadvantage. A highly compact industry, with nearly all its research centres and industry in one city, probably aided practical co-operation and helped to create the atmosphere that made co-operation desired.

MR W. CARR commented that, as one who had to keep abreast of current literature, he felt that the excellence of the abstracts put out by the PRS and PATRA (now PIRA) tended to defeat their own ends. The number of papers abstracted was now very great and very few of them were based on original work. Some form of critical assessment of the value of the papers was necessary.

MR H. K. RAASCHOU NIELSEN agreed that the PRS Review was of very high quality in an abstracting sense, including the excellent indexing, but he would very much like to see the abstracts classified in some way.

DR S. H. BELL commented that in classifying a paper there was always the danger of stressing one feature at the expense of another. So much depended upon the attitude of the abstracter.

MR RAASCHOU NIELSEN agreed that classification could be difficult, and could present a weakness, especially on an international scale. There were, however, only rarely difficulties with the Danish/Swedish classification. The opinion had been stated in Danish documentation circles that, speaking generally about articles in technical magazines, 5 per cent of the papers represented original work, a further 15 per cent did not present anything fundamentally new, but was nevertheless good material. The remainder was of more doubtful value.

DR G. L. FUCHS said that while the PRS and PIRA abstracts were excellent, they did not provide the means for usefully filing technical literature.

MR N. FISK commented that many years ago the PRS Review dismissed review articles with the one-word abstract "Review." This useful practice might be revived, and, at the other extreme, abstracts might start with the words "Original research," the length of the abstract conveying some indication of the value of the abstract.

MR T. R. BULLETT asked how the Scandinavian abstracts classified papers on the fringe of the interests of the paint industry, where, say, only 10 per cent of the paper was of interest.

MR RAASCHOU NIELSEN said that in this case the personal approach of the abstracter was especially important and it might be a matter of chance whether or not an article was abstracted at all.

DR BELL asked how one chose abstracters, particularly on an international scale. The US Federation of Societies for Paint Technology was at present studying the use of "keywords" as a means of classifying material. Some assistance in this matter had been given by OCCA and by the PRS.

MR RAASCHOU NIELSEN said that he had not yet received the US "Thesaurus of paint and allied technology" but that the possible use of the "keywords" contained in it as a basis for future classification would certainly be seriously considered in Scandinavia.

MR FISK commented that he had contributed an article, over 21 years ago, to Verfkroniek with the one-word title "Co-operation," but it had aroused little interest. At the end of his lecture Mr Raaschou Nielsen had used the phrase "with the members participating." What did one do when members did not wish to participate?

MR J. K. B. BURKE asked the speaker whether he considered that the tremendous effort on research and extensive co-operation by various bodies in these fields had been satisfactorily reflected in real progress?

MR RAASCHOU NIELSEN said that it was of course important to economise also with the time spent on co-operation, and that one had to avoid at all cost what could be termed "unnecessary co-operation," i.e., trivial or irrelevant matters. Co-operation was necessarily more important to a small country such as Denmark, and what had been achieved so far had certainly not been a waste of time.

MR J. A. L. HAWKEY said that it was very difficult to assess the value of research; in a sense it was like advertising. One should not overlook the fact that while the enormous amount of work done in industrial and research laboratories has produced results, these would probably have come more quickly through co-operation. Applied research very often indicated the areas where pure research was needed, and at this stage co-operation was even more essential.

MR J. E. POOLEY asked how the undergraduate student regarded the paint and printing ink industries, when chosing his career.

MR RAASCHOU NIELSEN said that in Denmark the interest in working in the paint and printing ink industry was probably greater than in other countries, e.g., Sweden, perhaps because there were only a few big chemical industries in Denmark to compete for staff.

DR R. H. LEACH congratulated Mr Raaschou Nielsen on the close co-operation between the Danish paint and printing ink industries and the universities. The British industries suffered from a weakness in this area. Such collaboration ensured a continuous flow of up-to-date fundamental knowledge passing from the universities to the industry.

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Transactions and Communications

The identification of pigments

By A. McClure, J. Thomson and J. Tannahill

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Summary

The isolation of pigments from a variety of liquid and solid media is discussed. Infra-red spectrophotometry is considered as a method of identifying pigments. The infra-red (650-5,000cm^{-1}) spectra of 96 organic pigments are presented. Thin layer chromatography gives excellent separations of mixtures of organic pigments.

L'identification de pigments

Résumé

On discute l'isolement de pigments à partir d'une gamme de milieux liquides et solides. On considère la spéctrophotométrie à l'infra-rouge en tant qu'une méthode pour l'identification de pigments. On présente les spectres infra-rouges (650-5,000cm^{-1}) de 96 pigments organiques. La chromatographie en couche mince donne d'excellentes séparations de mélanges des pigments organiques.

Die Identifizierung von Pigmenten

Zusammenfassung

Die Abtrennung von Pigmenten aus den verschiedensten Flüssigkeiten und Festkörpern wird besprochen. Infrarot-Spektophotometrie wird als eine für die Identifizierung von Pigmenten geeignete Methode angesehen. Es werden die infraroten (650-5,000cm^{-1}) Spektra von 96 organischen Pigmenten angegeben. Mit Hilfe von Dünnschicht-Chromatographie können Trennungen aus Mischungen organischer Pigmente mit ausgezeichnetem Erfolg durchgeführt werden.

Опознавание пигментов

Резюме

Обсуждается изоляция пигментов из различных жидких и твердых сред. Рассматривается инфракрасное спектрофотометрирование как метод опознавания пигментов. Прилагаются инфракрасные спектры (650-5,000см$^{-1}$) 96-ти органических пигментов. Тонкослойная хроматография дает отличную сепарацию смесей органических пигментов.

Introduction

The object of this paper is to report methods which simplify the identification of pigments.

A necessary preliminary to the identification of colours is their isolation from the matrix into which they have been incorporated.

Separated colours can be identified from their infra-red spectra if a suitable reference file is available.

Azo pigments not on record can be identified by fragmentation procedures, the products of which are generally readily identified by infra-red spectrophotometry.

Mixtures of pigments are common, and thin layer chromatography can be used to separate the component colours.

Classification of pigments

The following classification is that of Spencer[1].

Organic pigments

The majority of organic pigments are of the azo type.

Azo pigments contain one or more chromophore (—N=N—) groups. They may be sub-divided into:

Insoluble azo pigments—insoluble upon formation in the aqueous medium of manufacture.

Precipitated azo pigments—contain salt forming groups and require precipitation with metallic salts from the aqueous manufacturing medium.

Non azo pigments fall into groups:

(1) Phthalocyanine pigments.
(2) Quinacridone pigments.
(3) Dioxazine pigments.
(4) Vat dye pigments
    (a) Indigo and thioindigo pigments
    (b) Perylene pigments
    (c) Anthraquinone pigments.
(5) Salts of basic or acid dyes.
(6) Miscellaneous pigments
    e.g. Pigment Green B.

Inorganic pigments

Isolation of pigments

Samples submitted for the identification of pigments come in many forms. They may be liquid, such as aqueous dispersions, printing inks or paints for decorative or industrial use, or solid, such as coloured prints, paint films or plastic articles.

Each type requires a different method of attack.

Aqueous dispersions of pigments

An aqueous dispersion consists of a pigment or pigments suspended in a predominantly aqueous medium by means of surface active agents.

In such a dispersion the pigments are isolated and quantitatively determined by adding a boiling mixture of approximately 80ml of equal parts acetone and water to 5-10gm of weighed paste in a 100ml centrifuge tube. This treatment flocculates the pigments which are centrifuged down, washed well with hot acetone/water, and dried to constant weight. The addition of a few drops of hydrochloric acid is occasionally necessary to aid flocculation.

Carbon black dispersions are very resistant to coagulation, but after evaporation of the paste the surface active agents can be removed by dissolving in ethanol.

Liquid printing inks and paints

These are basically blends of pigments, resins and solvents. The pigments may be isolated by adding ether to dilute the medium and centrifuging down the pigments which flocculate accompanied by some or all of the resins. The latter may then be removed by extracting with boiling toluene: ethanol, 1:1. Hanson[2] used benzene to flocculate the pigments.

Dried films and plastics

Two techniques can be used to isolate pigments from paint films and plastics.

(1) The pigments, if organic, may be extracted from the binder. Organic pigments have limited solubility but identification methods are so sensitive that only a fraction of a milligram of pigment is required.

Chloroform is the most useful solvent for insoluble azo pigments and vat colours. Glacial acetic acid dissolves precipitated azo pigments.

(2) The binder may be dissolved leaving the pigments isolated. The binder should first of all be identified. In this connection infra-red attenuated total reflectance is useful. This is a technique in which a beam of infra-red radiation is reflected from the surface of a film where the compounds present absorb radiation at characteristic wavelengths, just as in transmission infra-red spectrophotometry. A normal infra-red spectrum is recorded. Several collections of the infra-red spectra of resins and polymers[3,4] are available to simplify identification.

Paint films

Alkyd and polyurethane paint films can be destroyed by boiling for several minutes with 20 per cent aqueous sodium hydroxide solution[5].

Acrylic and urea formaldehyde films dissolve when boiled with glacial acetic acid.

Nitrocellulose resins dissolve in acetone.

In these cases the pigments are isolated by centrifugation.

Epoxy paint films dissolve only in concentrated sulphuric acid. The solution in sulphuric acid must be "drowned out" into 20 parts of water and the organic pigments removed by extracting with chloroform or 1-methyl naphthalene[6].

Plastics

Haslam and Willis[4] list suitable solvents for the solution of plastics. The solvents include:

tetrahydrofuran for polyvinyl chloride compositions

tetrahydronaphthalene for polyethylene and polypropylene

formic acid for nylon

1, 2-dichlorethylene for polystyrene.

Centrifugation isolates the pigments from the polymer solutions. If the pigment concentration in the polymer is low, the powerful solvents used to dissolve the polymer may also dissolve the organic pigments. In such cases, the polymer is reprecipitated by adding a diluting solvent such as ethanol or chloroform and then removed by centrifugation. A large part of the pigment or dye remains in supension or solution and is concentrated by steam distilling the solvent. (Total destruction of small quantities of organic pigments can result if high boiling liquids such as tetrahydronaphthalene are evaporated by boiling.) Further purification of organic colourants by thin layer chromatography is necessary to remove residual polymer and plasticiser.

The infra-red identification of pigments

Methods for the identification of common organic pigments from crystal form[7], melting point[8], behaviour towards acids and alkalis[9], visible absorption spectra[6], have all been published. These methods are not always specific and may call for reference samples. Azo pigments can also be identified by fragmentation procedures,[9, 10] a technique requiring no reference sample.

The use of infra-red spectrophotometry is so well documented that no further explanation of the principles seems necessary. The present work has been carried out on a Unicam SP 200 instrument.

Infra-red spectrophotometry permits the speedy unequivocal identification of pigments provided that a file of identified pigment spectra is available. Collections of inorganic pigment spectra have been published[11, 12] and the collection accompanying this paper is designed to provide a reference library of organic pigment spectra.

The spectra recorded here were all obtained from potassium bromide discs, which have the advantages that very small samples of pigment can be handled—as little as 20 micrograms of pigment pressed into a micro disc can give an identifiable spectrum—and methyl or methoxyl bands are not obscured as they are when liquid paraffin mulls are used.

Small differences are occasionally observed when comparing the infra-red spectrum of an organic pigment recorded in liquid paraffin with that of a salt disc. The differences are extra bands or a shift in band position or intensity, due to crystal changes induced by pelletising, but are rarely troublesome.

Additional infra-red techniques

Infra-red spectrophotometry is generally insensitive to impurities and as much as 20 per cent of a diluent, such as a resin, inorganic material or other pigment, does not interfere with the identification of the main component.

In a mixture of two pigments the minor fraction can sometimes be identified using compensation techniques on the infra-red spectrophotometer. A thick film of the mixture in liquid paraffin is placed in the sample beam of the spectrophotometer. A mull of the already identified component is placed in the reference beam. This latter film is gradually thinned until the absorption bands of the known colour are cancelled. The spectrum remaining is that of the other pigment present. Recently a technique which uses a wedge-shaped compensating disc has been described[13].

Paint panels exhibiting "chalking" are occasionally submitted for identification of the offending material. The recommended procedure is to rub potassium bromide over the bloom then press it into a disc. An excellent spectrum invariably results.

Millipore filters are very useful for isolating traces of fine pigment particles from fluids. The filter containing the entrained pigment can be mounted directly in an infra-red spectrophotometer and the bands due to the cellulose nitrate-acetate of the filter compensated by a blank filter in the reference beam[14]. The pigment can also be identified by attenuated total reflectance[15].

The identification of new azo pigments

The infra-red spectrum of a pigment is so complex that it is impossible to deduce, from inspection of the spectrum, the exact molecular structure, but the pigment can very often be classified, and functional groups noted. For complete identification the pigment must be broken down into units whose infra-red spectra can be identified.

Azo pigments lend themselves readily to such methods of analysis.

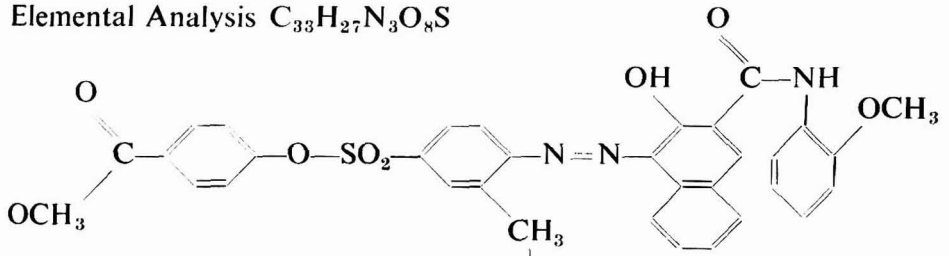
Muzik[10] reduced the azo linkage with tin and hydrochloric acid. He identified the aromatic amines formed by paper chromatography.

Hargreaves[9] preferred sodium dithionite as the reducing agent. The amines were isolated by steam distillation or ether extraction of the reaction mixture. Dry distillation of an azo pigment with four times its volume of soda lime or anhydrous sodium dihydrogen phosphate also gave a mixture of amines. The amines were characterised by melting or boiling point and by the preparation of crystalline derivatives.

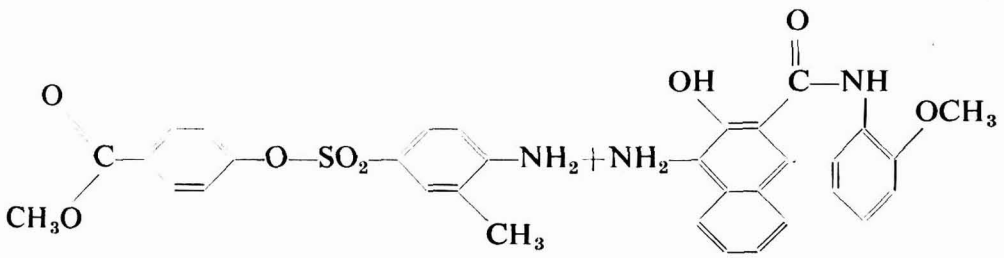
If infra-red identification of the fission products from Hargreaves's method is used, smaller samples can be handled and it becomes speedier, provided a good library of amine spectra is available. Even if the products cannot at once be identified, infra-red spectrophotometry gives useful information which builds up a picture. The examples which follow are designed to illustrate these points.

Red pigment

Elemental Analysis $C_{33}H_{27}N_3O_8S$



aqueous sodium dithionite reduction.



chloroform extraction

Infra-red indicates
(1) Amine
(2) Ester
(3) Sulphoxide grouping
(4) 1, 4-disubstituted benzene ring

alkaline hydrolysis

Acidification and ether extraction

1-amino-2-hydroxy 3-naphthoic acid identified by infra-red

Steam distillation

o-anisidine identified by infra-red

alkaline hydrolysis

acidification and ether extraction

Infra-red identified *p-hydroxy benzoic acid*

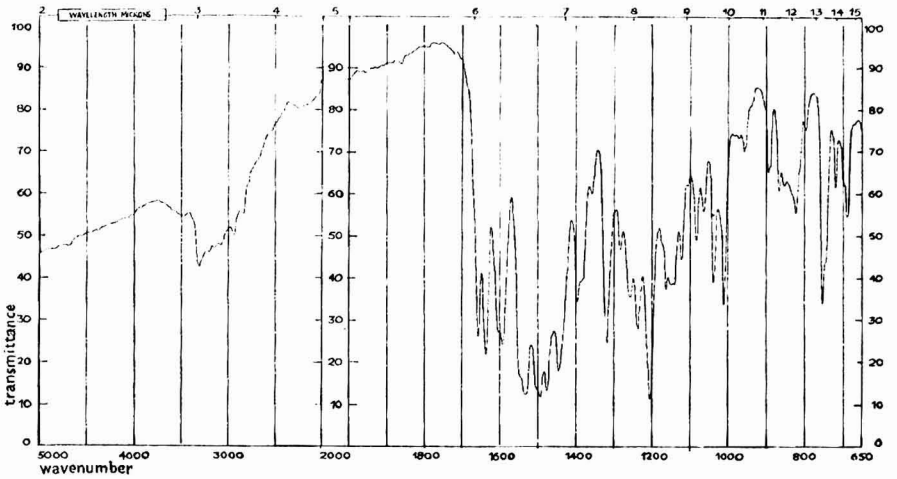
steam distillation

Infra-red identified *o-toluidine*

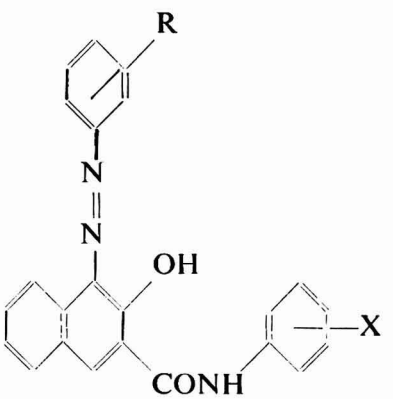
A carmine shade pigment

Elemental analysis $C_{33}H_{22}N_4O_6Cl$

Infra-red spectrum



Inspection of the spectra of a number of pigments of the type



reveals secondary amide bands at 1,650cm^{-1} and 1,550cm^{-1}, which are, of course, found in other types of pigment, but in addition they possess a strong band at 1,020cm^{-1} and a short sharp band at 900cm^{-1} which are diagnostic for this class of pigment.

The pigment skeleton can be written at once.

In this particular spectrum two sets of secondary amide bands are present at 1,638cm^{-1} and 1,658cm^{-1}.

The pigment was refluxed with ethanol and a slurry of sodium dithionite in aqueous alcohol added until the colour was all reduced. The alcohol was removed and the residue ether extracted. A potassium bromide disc of the extracted material gave the following infra-red spectrum.

Protection above all– with Cardura

Paint based on Cardura in combination with melamine formaldehyde or acrylics gives excellent protection from corrosion and weathering for coil coated steel and aluminium.

Coil coating is used all over the world for wall partitions, hangers, caravans, buildings and roofs.

In fact, wherever a strong finish is needed, Cardura-based paint is the perfect choice.

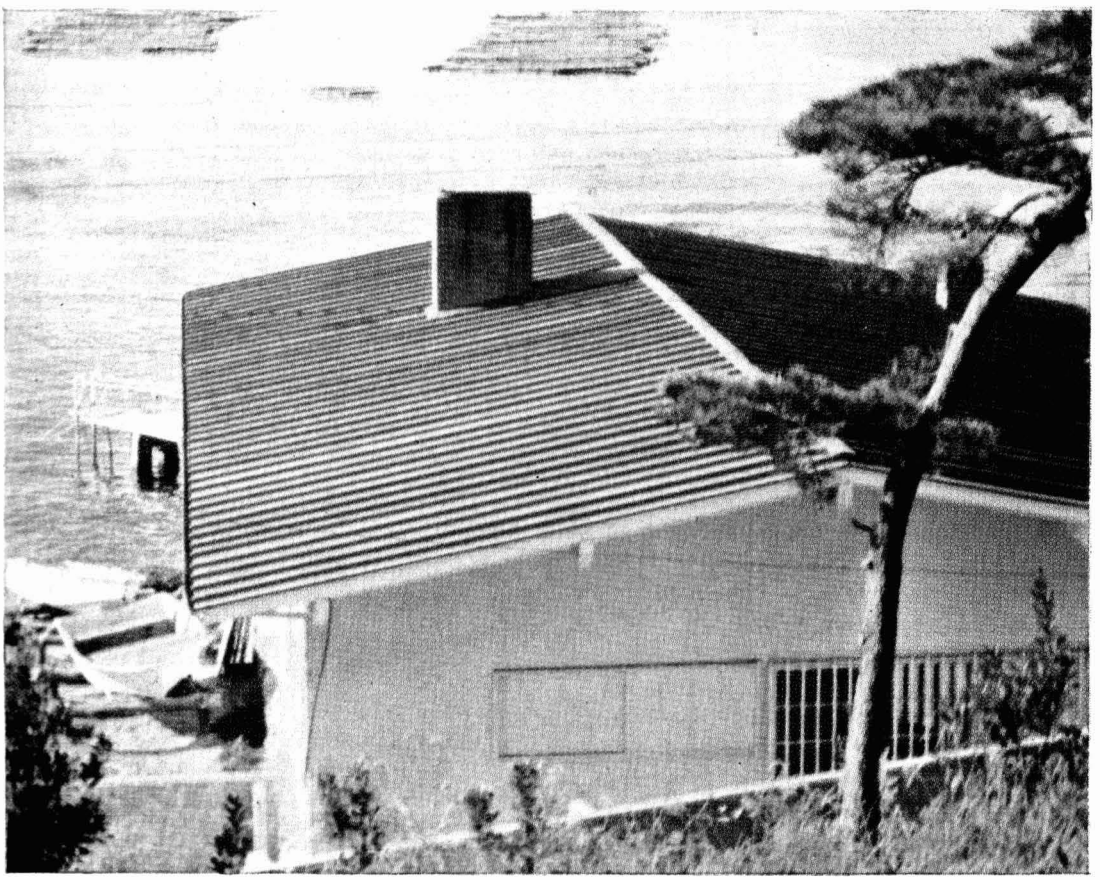
The roof in the photograph is a good example of one of these uses to which Cardura has been put.

The great advantage of Cardura is its versatility. Whether in combination with acrylics, melamine or urea formaldehyde resins or nitrocellulose, Cardura gives your paint the resistant qualities that are needed for all domestic appliances, cars and other equipment subject to wear and tear.

Cardura is strong enough to face attacks from lubricants, shoe polish, even tar and bitumen. You name it. Cardura fights it!

For further details of Cardura resins, contact your Shell company. In the UK apply to your Shell Chemicals regional office or Shell Chemicals UK Limited, Shell Centre, London, SE1.

Shell Chemicals SHELL



The tie is blue terylene, with the Association's insignia woven in red and gold silk.

The blazer badge has the insignia embroidered in silver and gold wire on a red and blue ground.

The plaque has the insignia hand-painted in red and gold on a blue ground.

The car badge has the insignia embossed in red and gold on a blue ground, the whole being covered in transparent polypropylene, with a thick chrome surround. Bar and grille fittings are available.

In order to commemorate the Fiftieth Anniversary of OCCA, Council has authorised the production of a tie, blazer badge, wall plaque and car badge bearing the Association's insignia. These items are available only from :—

THRESHER & GLENNY

Lancaster Place, Strand, London, W.C.2.

To : Thresher & Glenny Ltd., Lancaster Place, Strand, London, W.C.2.
As a member of the Association, please accept my order for the following:

..... OCCA tie	@ 20/–	
..... OCCA blazer badge	@ 63/–	
..... OCCA wall plaque	@ 33/6	
..... OCCA car badge (state bar or grille)	@ 36/6	
(All prices include postage and packing)		
If tie is required airmail add	6s. 6d.	
Total Remitted		

Name .....

Section/No. .....

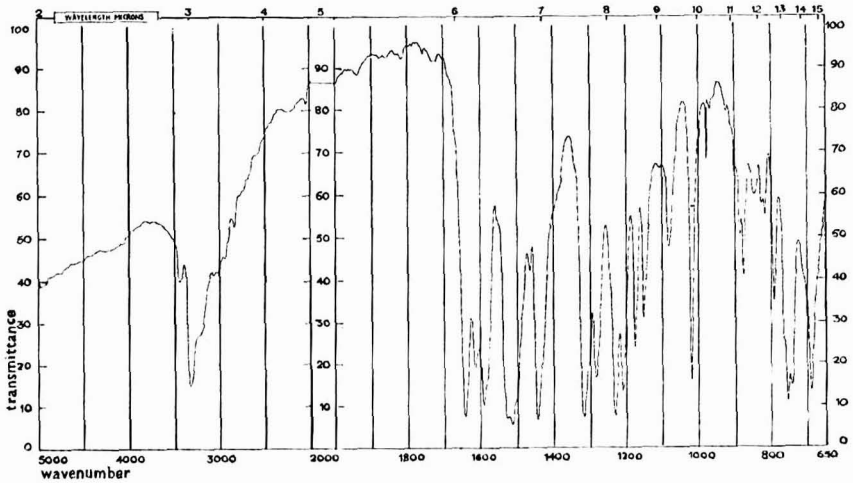
Address .....

.....

.....

.....

The ties will be supplied from stock; all other items are made to order. Only the tie can be supplied by airmail at an extra cost of 6s. 6d.



Inspection reveals:

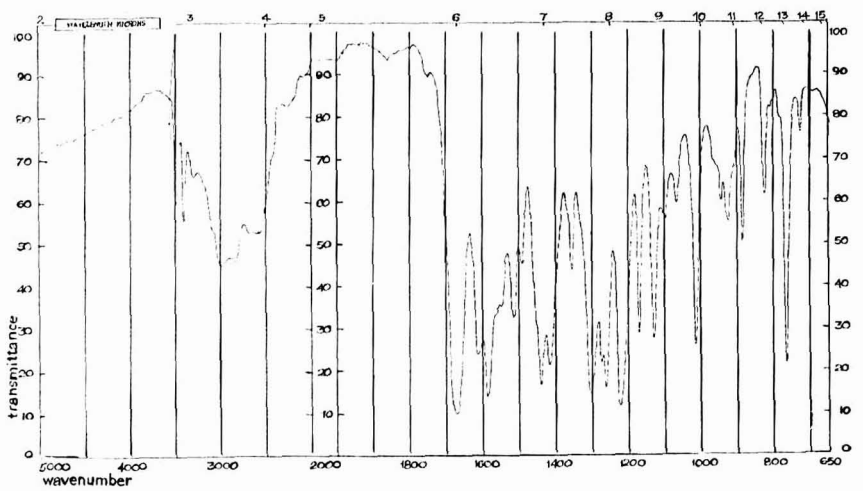
amino bands at 3,300cm^{-1}

methoxy band at 2,830cm^{-1} with an ether band at 1,230cm^{-1}

amide bands at 1,643cm^{-1}, and 1,530cm^{-1}

a mono substituted benzene ring.

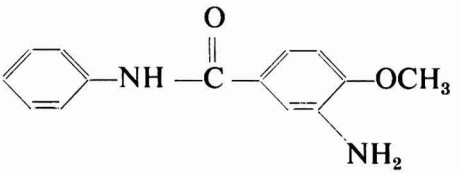
Hydrolysis of the amide linkage was the next step. This was achieved with 20 per cent aqueous sodium hydroxide. Steam distillation gave aniline. Acidification of the alkali and ether extraction led to the spectrum following:



Amino, methoxy and carbonyl bands are present.

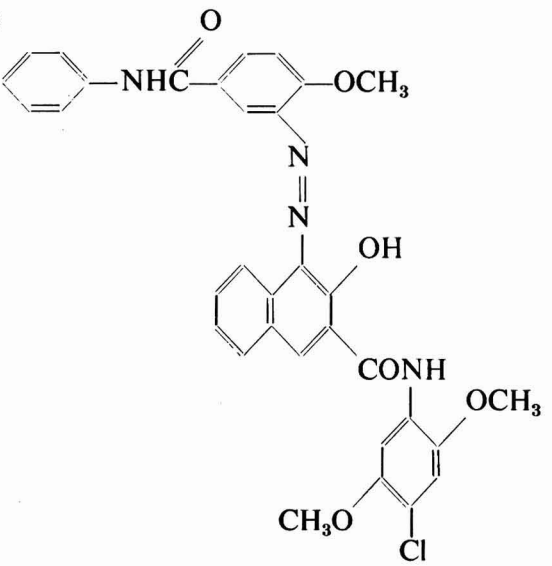
The position of these bands in relation to each other cannot readily be deduced. The soda lime distillate from a portion of this material was o-anisidine. The remainder was diazotised with hydrochloric acid and sodium nitrite, then stirred with hypophosphorous acid for one hour. The product was p-methoxy benzoic acid, identified by infra-red comparison.

The original amine used for the pigment was



The residue from the original reduction of the pigment was refluxed with 20 per cent NaOH and steam distilled. White crystals separated—readily identified as 2, 5-dimethoxy-4-chloraniline.

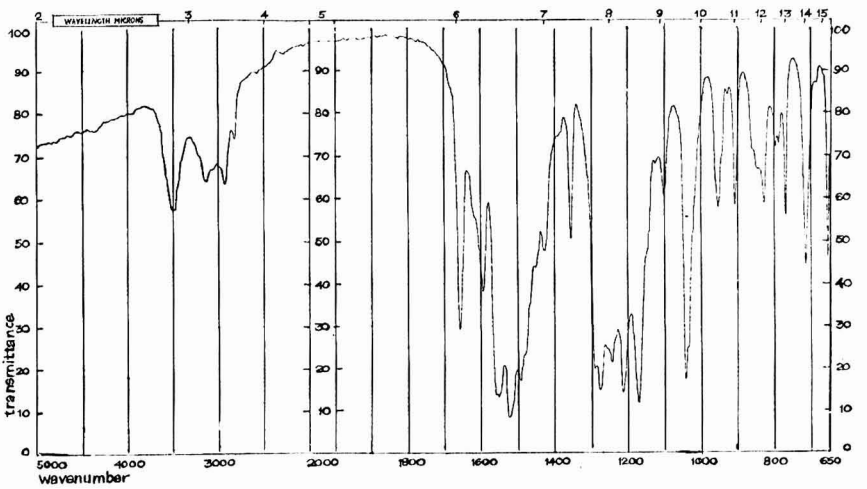
The pigment was



It is useful to remember that the method of manufacture of many azo pigments is such that the final pigment may contain a small amount of unreacted coupling component, which can be extracted from the pigment by ethanol and identified from its infra-red spectrum.

Yellow Pigment

Elemental analysis $C_{38}H_{38}N_6O_{14}S_2Cl_2Ba$

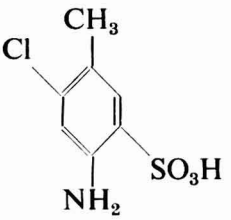


The infra-red spectrum indicates—amide grouping

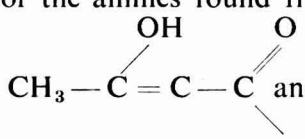
—sulphonic acid grouping.

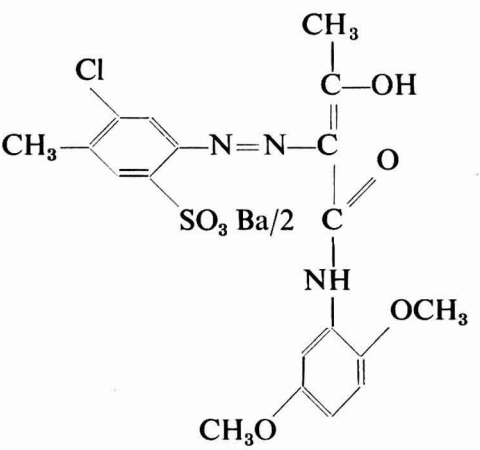
Azo yellow pigments are often derived from acetoacetarylamide coupling components which cyclise on reduction of the pigment to give pyrazines[16], therefore only one aromatic amine can be obtained from a reduction mixture.

In this case, reduction with aqueous sodium dithionite followed by acidification with concentrated hydrochloric acid precipitated a fraction readily identified as 2B acid



Soda lime distillation of the pigment followed by thin layer chromatography of the distillate revealed the presence of two aromatic amines. One was, of course, 2-chloro-4-amino-toluene from the 2B acid moiety. The other was identified by infra-red as 2, 5-dimethoxy aniline.

Subtraction of the amines found from the elemental analysis left $C_4H_4O_2$, equivalent to  and synthesis confirmed the pigment as



The separation of mixtures of colours

Mixtures of colours are common, in fact chromatographic examination of organic colours leads to the wry conclusion that there are very few pure pigmentations. Everything is shaded—see Plate 1.

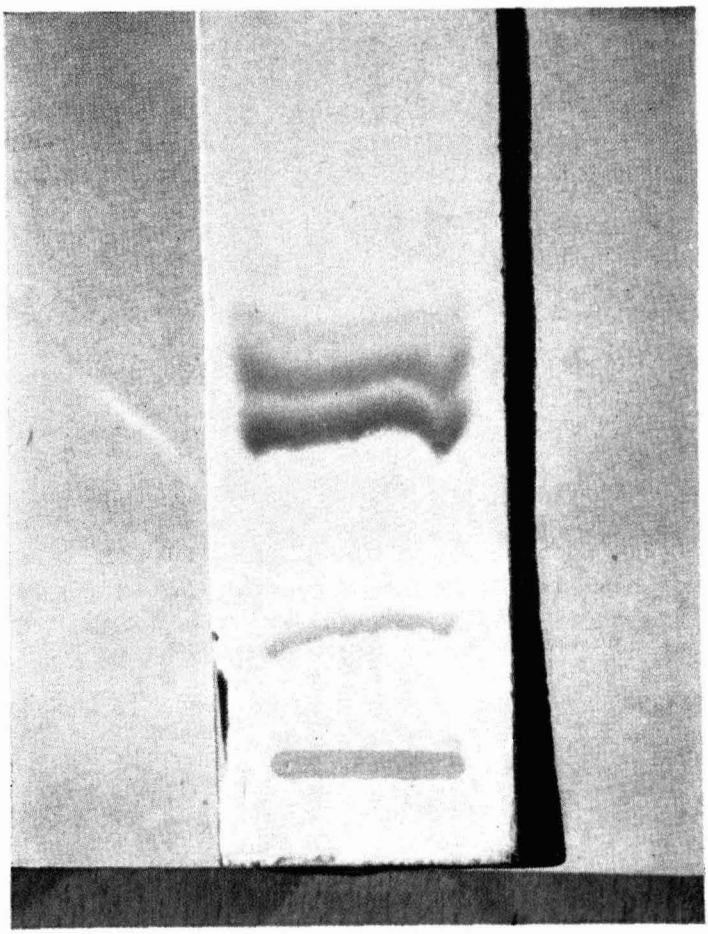


Plate 1—Pigments from printing ink. Developing solvent chloroform/xylene; 3/1. In order of increasing R_f the pigments are 2B toner (Pigment Red 48), Carmine FBB (Pigment Red 146), Red RL (Pigment Red 10), Orange G (Pigment Orange 13), Xylidide Benzidine Yellow (Pigment Yellow 13)

Mixtures of pigments can be separated by exploiting solubility differences; for example, CI Pigment Red 12 is fairly soluble in hot toluene, CI Pigment Red 5 is not. Sublimation can be used—CI Pigment Yellow 1, a monoazo yellow, can be sublimed away from CI Pigment Yellow 13, a disazo yellow[17]. Paper chromatography[18] has been used with some success.

Thin layer chromatography gives reliable quick separations of pigments and dyes. The number of components in a mixture can be seen at a glance and their probable identity deduced from the shade and R_f value, if reference compounds are available to run in parallel. After development, the plates may be sprayed with concentrated sulphuric acid which changes the hue and may aid identification.

Individual components can be isolated from thin layer plates for infra-red identification.

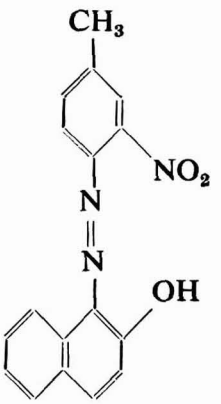
Insoluble azo pigments

Chloroform is a satisfactory solvent for obtaining dilute solutions of most azo pigments for chromatography and has the advantage that it is easily removed and is pleasant to handle.

Mono azo reds and orange pigments

These consist of various aromatic amines diazotised and coupled to β-naphthol,

e.g. CI Pigment Red 3 (Toluidine red)



or various aromatic amine couplings on to β-hydroxynaphthoic arylamides such as CI Pigment Red 2 (Red F2R).

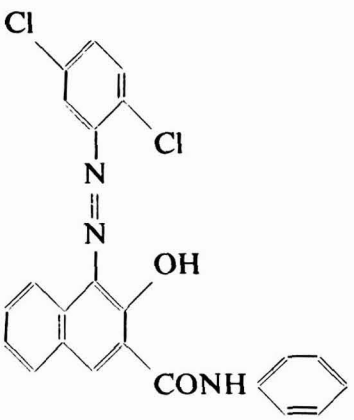


Plate 2 demonstrates that thin layer chromatography on silica gel with chloroform:xylene 3:1 as developing solvent gives excellent separations of these types of pigment.

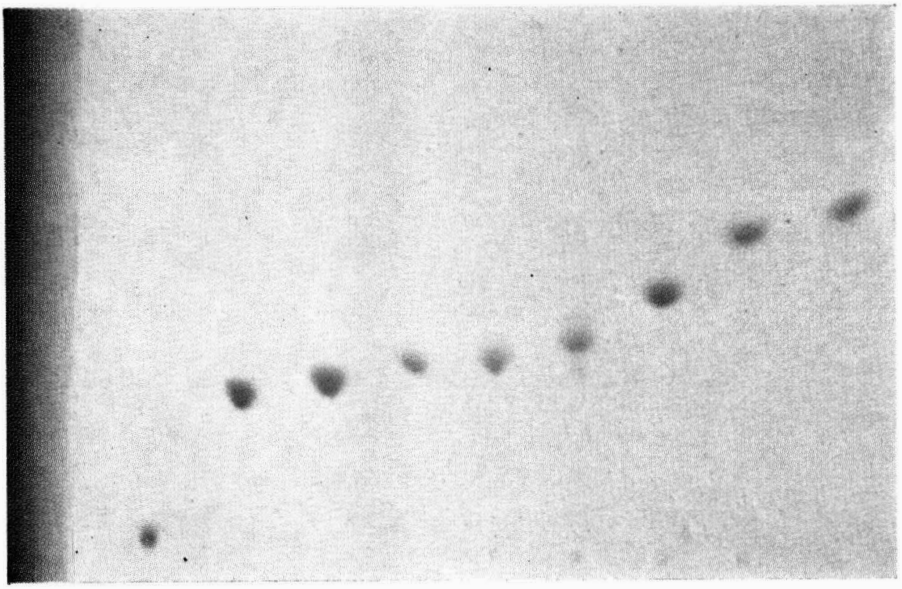
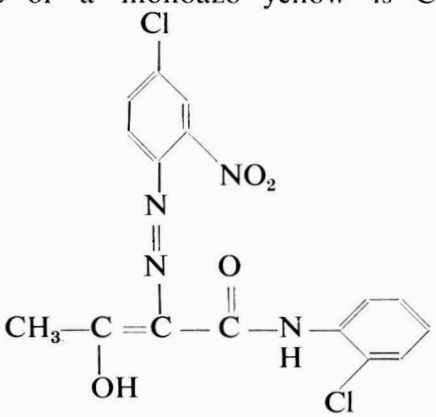


Plate 2. Pigments in order of increasing R_f: Pigment Red 45, 5, 12, 3, 112, 10, 8, 7, 11

Monoazo yellows, disazo yellows and oranges

A common example of a monoazo yellow is CI Pigment Yellow 3 (Yellow 10G).



CI Pigment Orange 13 (Orange G) is an example of a disazo orange.

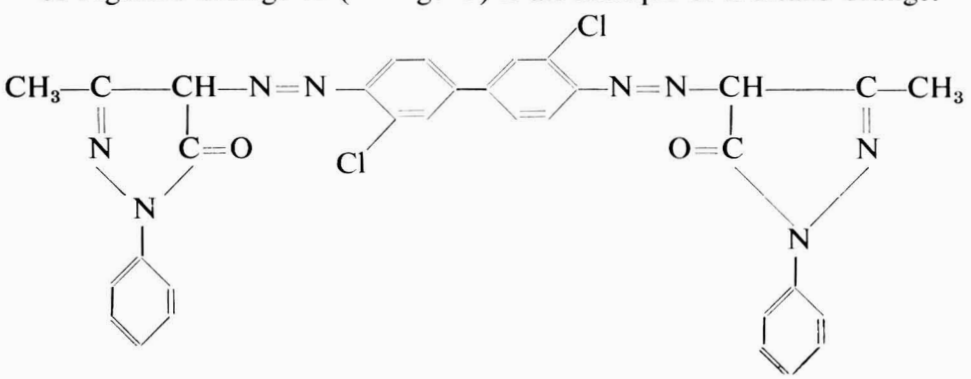


Plate 3 illustrates the separations possible using chloroform:toluene:benzene 1:1:1 as developing solvent.

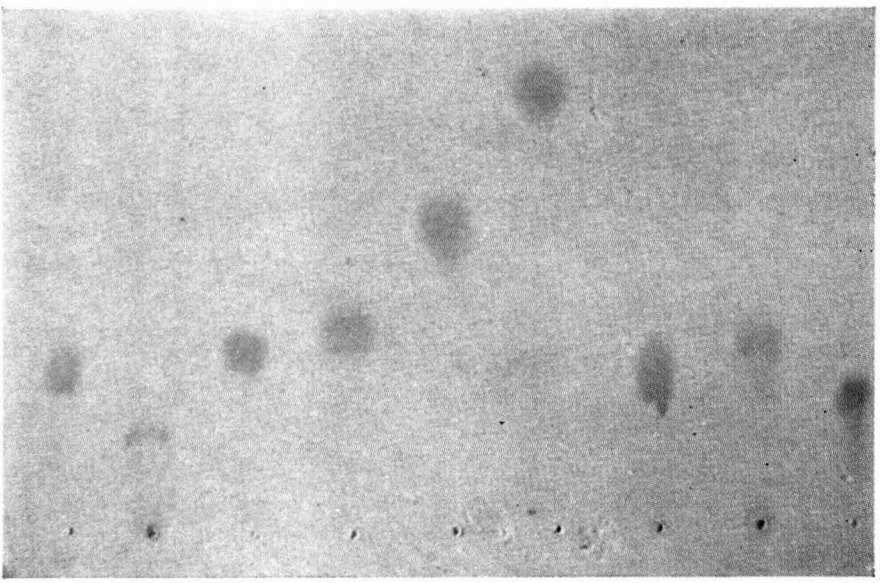
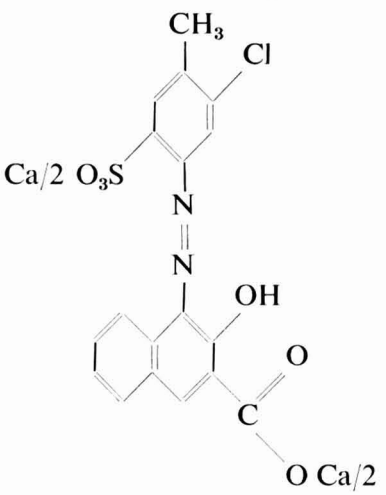


Plate 3. Pigments from left to right: CI Pigment Yellows 12, 17, 1, 4, 3, 10. CI Pigment Orange 13, 5, unlisted pyrazolone orange

Precipitated azos

An example of a typical precipitated azo pigment is Pigment Red 48 (2B toner).



Precipitated azos are insoluble in chloroform but bleed in glacial acetic acid. They can be separated and identified by thin layer chromatography on plates coated with microcrystalline cellulose. The plates are prepared from a slurry of 2 parts microcrystalline cellulose to 5 parts water. The developing solvent is methanol 75 parts, water 75 parts, hydrochloric acid 1 part—See Plate 4.

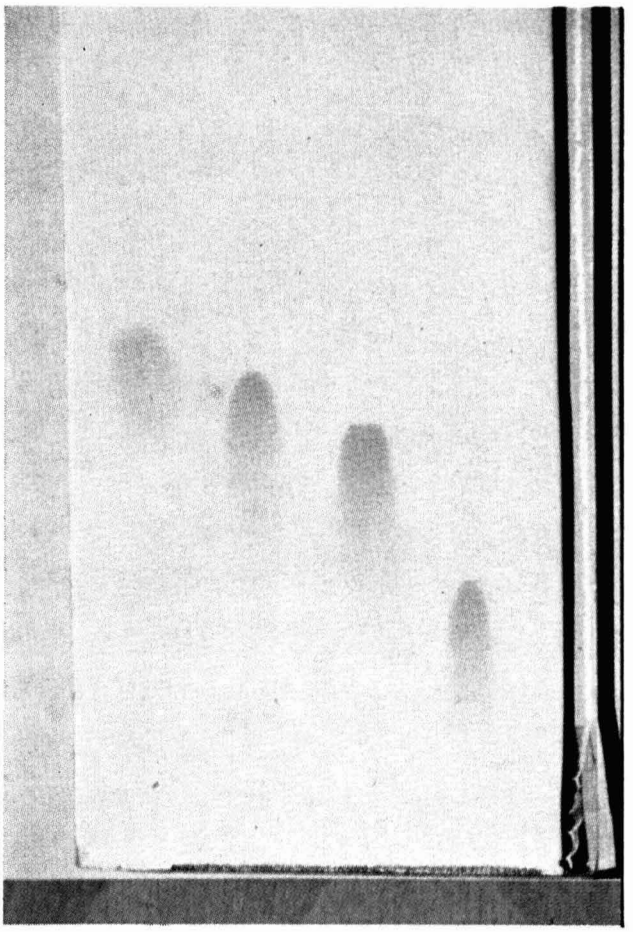
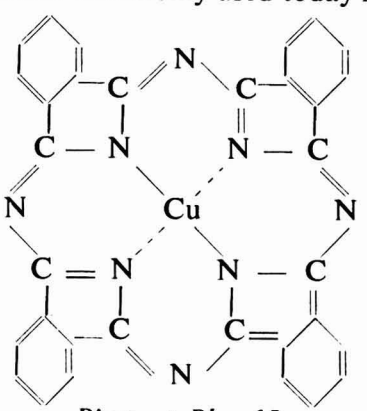


Plate 4. Pigments, in increasing R_f, Pigment Red 49, 48, 57, 53

Phthalocyanines

The blue organic pigment most commonly used today is copper phthalocyanine blue



Pigment Blue 15

This pigment is marketed in two crystal forms, or mixtures of the two, which are easily distinguished by infra-red spectrophotometry owing to their distinctive spectra.

The complexed metal is almost exclusively copper but other metals are occasionally encountered and metal-free phthalocyanine is commercially available.

If 14-15 of the ring hydrogens are replaced by halogens, phthalocyanine green is obtained.

The insolubility of most of this class of pigments facilitates their separation from resins and polymers and from other pigments.

Many pigment mixtures have small amounts of phthalocyanines incorporated as shading components; e.g. a maroon may be a red shaded with phthalocyanine blue; a green may be a yellow shaded with phthalocyanine blue or green. When present in such small quantities, phthalocyanine can readily be identified by dissolving the mixture in concentrated sulphuric acid and recording an absorption curve over the range 400 to 1,000nm on a spectrophotometer[25].

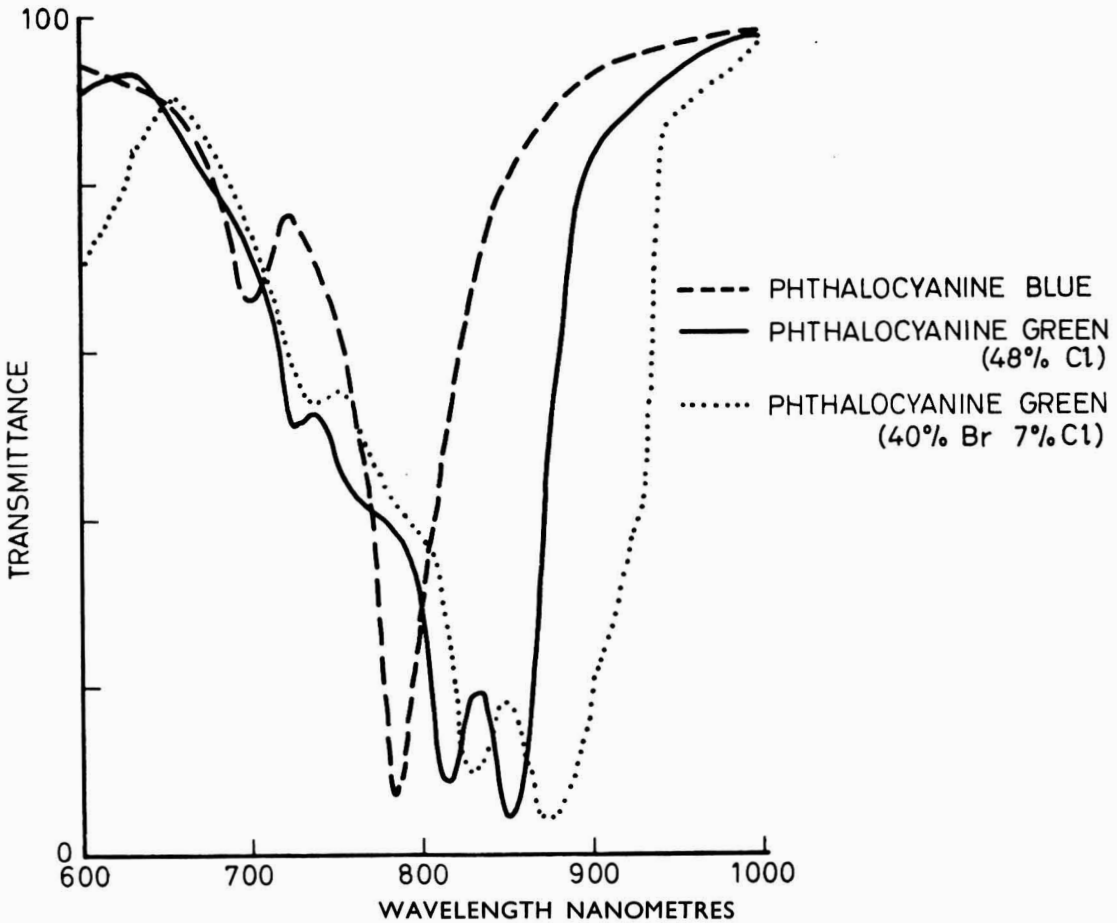
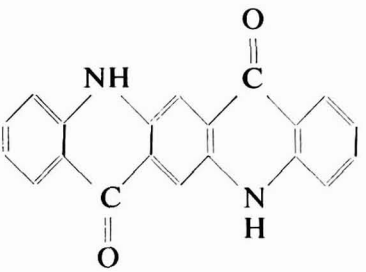


Fig. 1. Absorption curves for phthalocyanine pigments

It is exceptional to have to resort to chromatography with phthalocyanines, but phthalocyanine blue can be separated from phthalocyanine green or dioxazine violet by dissolving in 1-methyl naphthalene, spotting on a silica gel plate and developing the chromatogram with 1-methyl naphthalene. The spots are not dried off before developing.

Quinacridones



Pigment Violet 19

Linear *trans*-quinacridone is a relatively recent arrival on the pigment scene. It is quite extraordinary that such a simple compound can be so insoluble and can exhibit such a variety of hues. The insolubility is attributed to hydrogen bonding between adjacent molecules. The various hues depend on the particle size and crystal form of the pigment. The differing crystal forms are easily picked out by infra-red spectrophotometry from liquid paraffin mulls. In practice this is rarely necessary as the colours are so different.

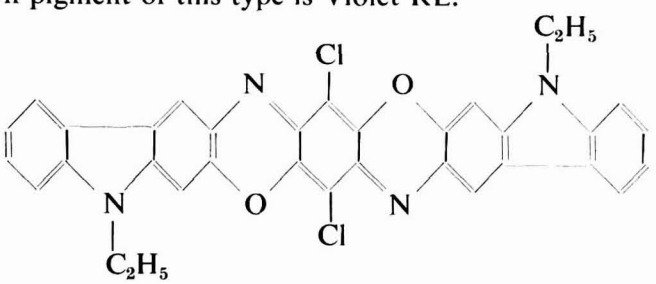
gamma crystal form — red
beta crystal form — violet

Substituted quinacridones, such as 2,9-dimethyl quinacridone, are also available as pigments.

The visible absorption spectra of quinacridones in concentrated sulphuric acid are very characteristic[19].

Dioxazine pigments

The best known pigment of this type is Violet RL.



Pigment Violet 23 (Violet RL)

This pigment is frequently encountered blended with phthalocyanine blue. he infra-red spectrum is, of course, very characteristic, and careful compensa-

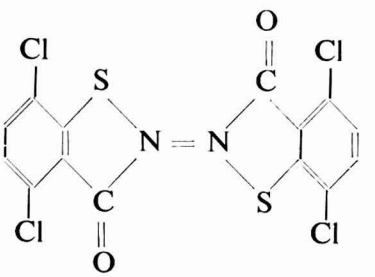
tion to cancel the spectrum of the phthalocyanine blue usually reveals that of the dioxazine violet.

Irgazin Violets BLT and 6RLT are more recent pigments of similar type.

Indigo and thioindigo pigments

Indigo has been used for generations. It dissolves in solvents such as chloroform or acetone. Substituted indigos are not used as pigments.

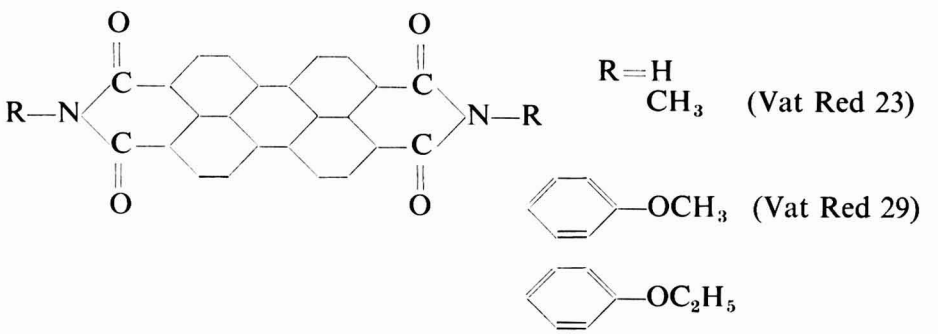
Thioindigo, discovered some sixty years ago, is obtained by replacing the two N-H groups of indigo by S. The substituted thioindigos form a series of pigments ranging in shade from pink to violet[20]. The most popular thioindigo pigment is Pigment Red 88.



Pigment Red 88 (*Thioindigo Bordeaux*)

The thioindigo pigments, like indigo itself, can be purified by sublimation. Solutions of the thioindigo pigments in chloroform can be separated by chromatography on silica gel plates with benzene: chloroform 4:1 as developing solvent.

Perylene pigments



The perylene red pigments can withstand high temperatures, making them particularly useful for plastics.

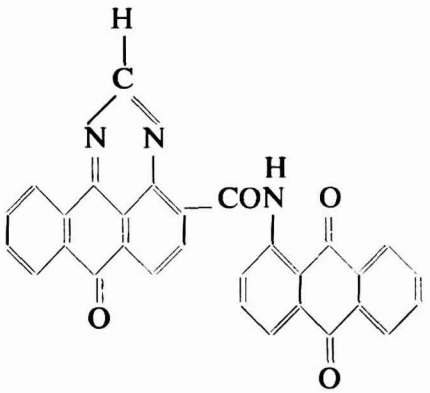
The visible absorption spectra of the pigments in concentrated sulphuric acid can be used to characterise the perylene type[5].

Chromatographic separations on silica gel, using chloroform as eluant, can be used when mixtures are suspected.

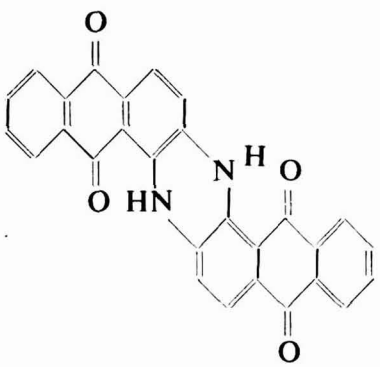
Anthraquinone pigments

The anthraquinone pigments in common use correspond to known textile vat dyes. They have been well documented by Vesce[21, 22].

The pigments span the spectrum from yellow, e.g. anthrapyrimidine yellow (Vat Yellow 20)



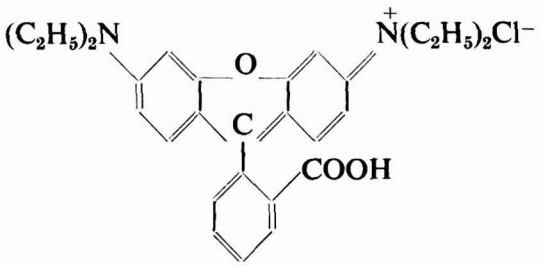
through orange and violet to blue e.g. Indanthrone blue (Vat Blue 4).



Lakes of basic dyes

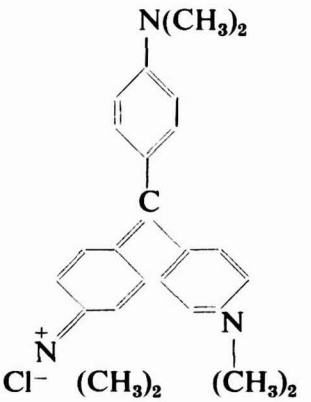
Basic dyes in the form of their complex lakes are used almost entirely in printing inks. The basic dyes most commonly encountered are

Rhodamines e.g.



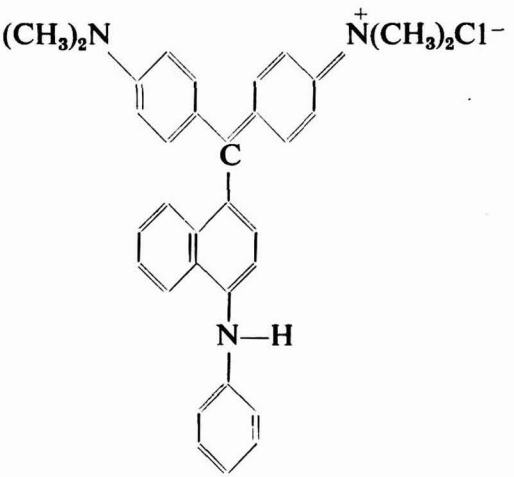
Rhodamine B *Basic Violet 10*

Methyl Violets e.g.



Methyl Violet 10B *Basic Violet 3*

Victoria Blues e.g.



Victoria Blue B *Basic Blue 26*

The laking compounds most commonly used are:

phospho-molybdic acid
phospho-molybdotungstic acid
copper ferrocyanide.

Infra-red analysis can distinguish between these different laking compounds and ashing and qualitative inorganic analysis confirms the elements present.

Infra-red spectrophotometry is less successful at identifying the dyes used in the pigments. Each pigment will almost certainly contain several laked dyes and the infra-red spectra of all Rhodamine lakes are similar but differ from those of Victoria Blue or Methyl Violet.

The basic dyes are best identified by thin layer chromatography. The free dyes can be obtained from the pigments by warming with ethanol acidified with a few drops of hydrochloric acid.

The developing solvent is *n*-butanol:water:ethanol 9:1:3 plus 1 per cent acetic acid recommended by Rettie & Haynes[23] in their excellent review on the separation of dyestuffs by thin layer chromatography.

Final identification is made by running the probable dyes in parallel and comparing R_f values, hues and ultra violet fluorescence—see Plate 5.

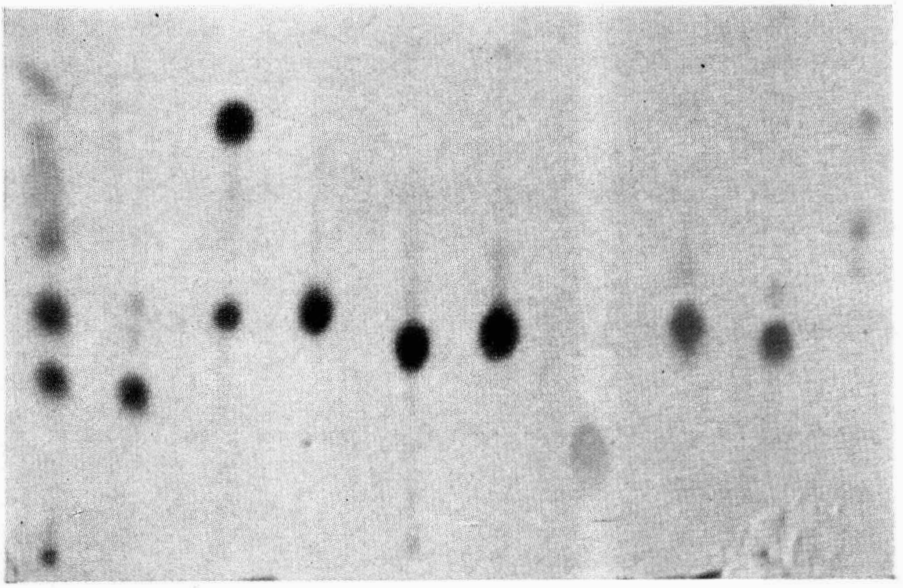
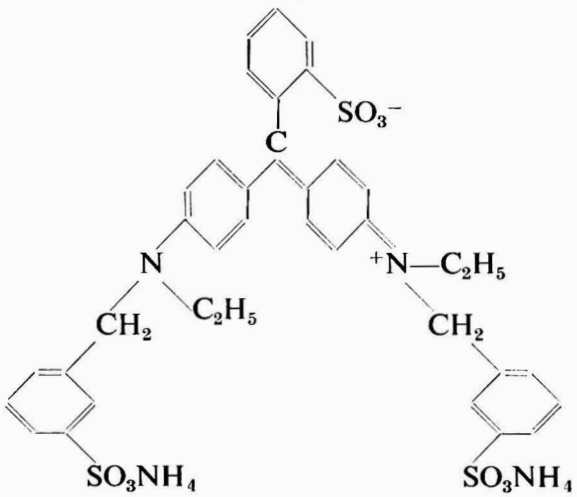


Plate 5. Basic dyes from left to right are: CI Basic Violets 1, 3; Basic Blues 7, 11, 26; Basic Green 1; Basic Yellow 1; Basic Violets 11, 10; Basic Red 1

Lakes of acid dyes

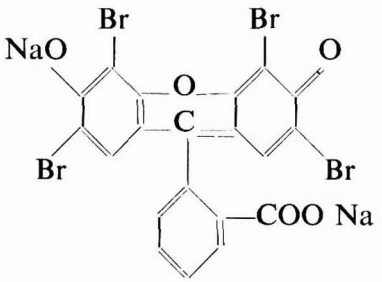
Peacock Blue, the barium lake of Acid Blue 9 struck on alumina is occasionally encountered—usually mixed with phthalocyanine blue



Acid Blue 9 (Erioglaucine)

Several other acid dyes of the triaryl methane type are used blended with Acid Blue 9. They can be separated by thin layer chromatography on silica gel using a developing solvent of *n*-butanol:water:ethanol 9:1:3 plus 1 per cent conc. ammonia. A solution of the dyes is obtained by warming the lake with acidified ethanol.

Phloxine Toner: This pigment is the lead salt of tetrabromo fluorescein:



Acid Red 87

The hue of the pigment depends on the purity of the Acid Red 87. Thin layer chromatography on silica gel with a developing solvent[23] of benzene: dioxan:acetic acid 90:25:4 detects manufacturing variations and additional dyestuffs.

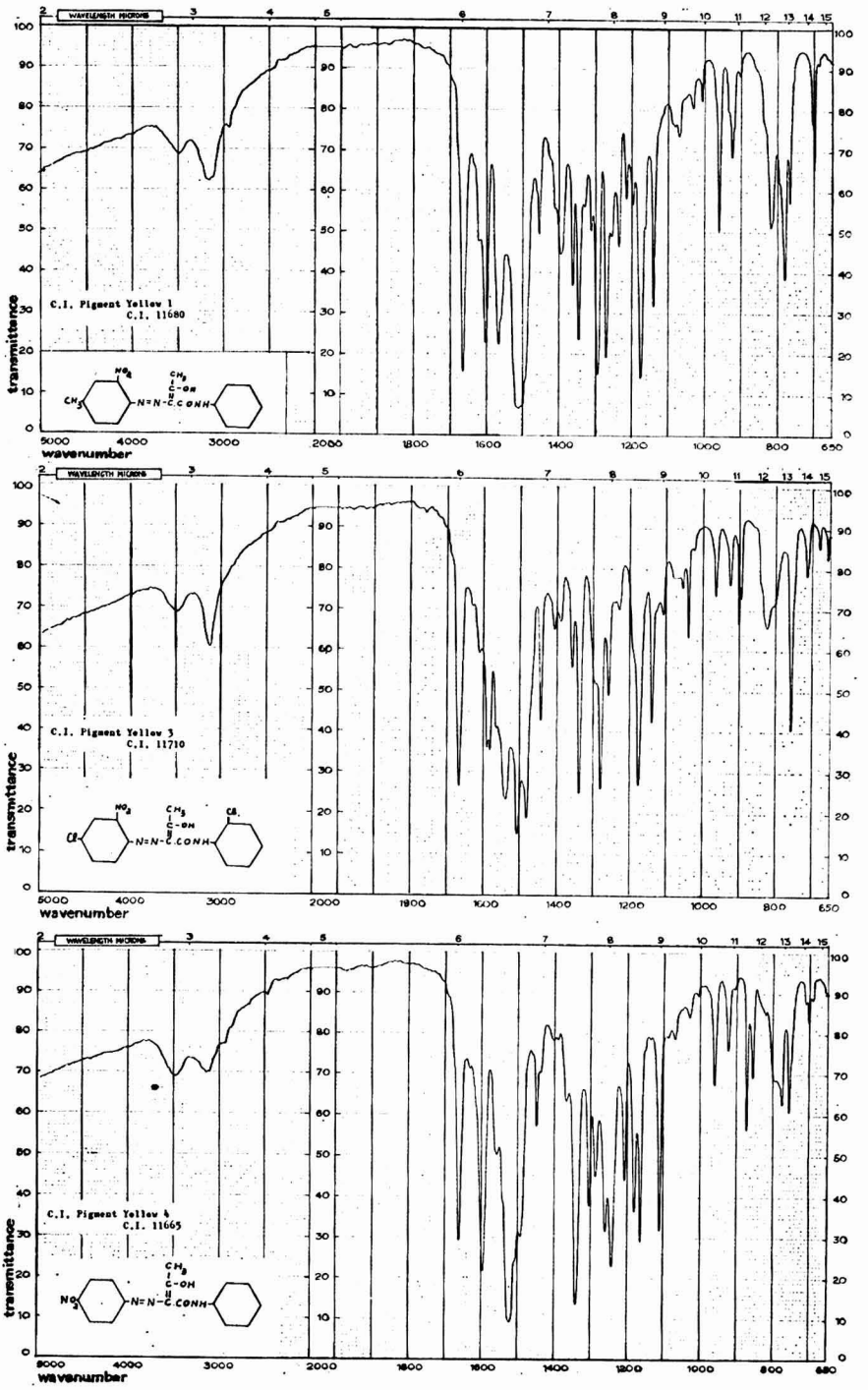
Inorganic pigments

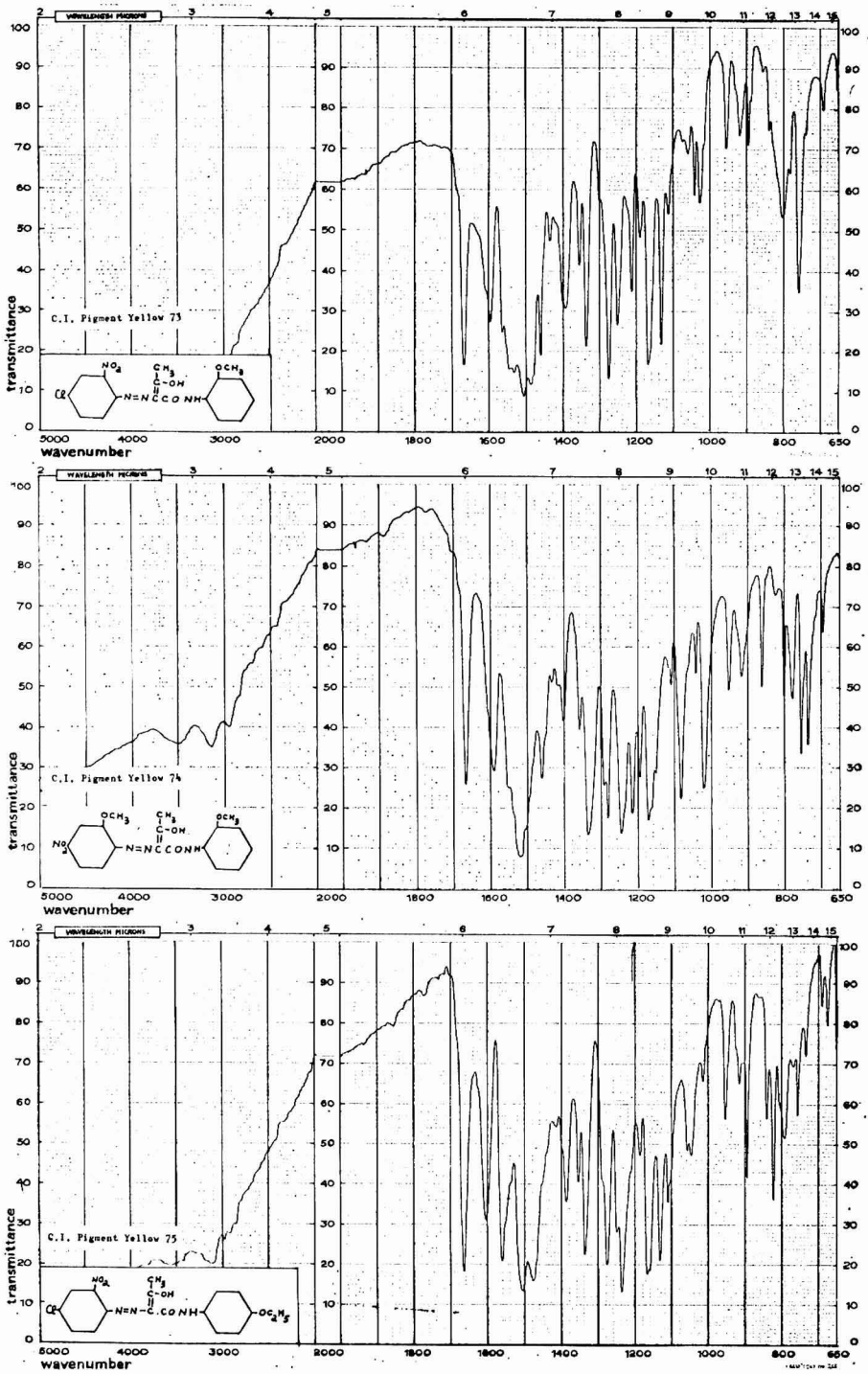
Inorganic pigments are readily separated from resins or organic pigments by virtue of their inert nature and their identification rarely poses any problem. In many cases infra-red analysis still gives useful information[11, 12] and mixtures of inorganic pigments can be resolved.

Compounds such as prussian blue, titanium dioxide, china clay, silica, chromates, sulphates and carbonates all have distinctive spectra leading to identification which can be confirmed by inorganic qualitative analysis.

Hezel[24] has pointed out that in a complex mixture of inorganic pigments a knowledge of the elements present does not necessarily enable one to identify the component pigments. He has evolved a schematic method of analysis which permits identification of the individual pigments.

Pigment spectar




C.I. Pigment Yellow 73
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C.I. Pigment Yellow 75
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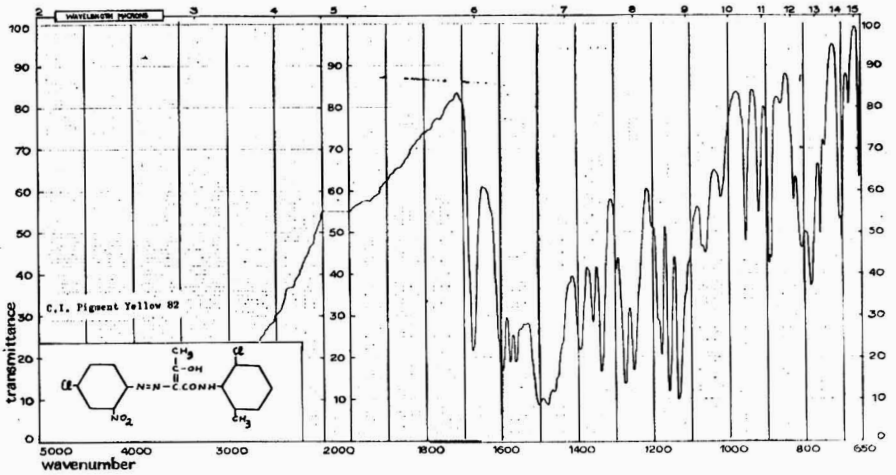
wavenumber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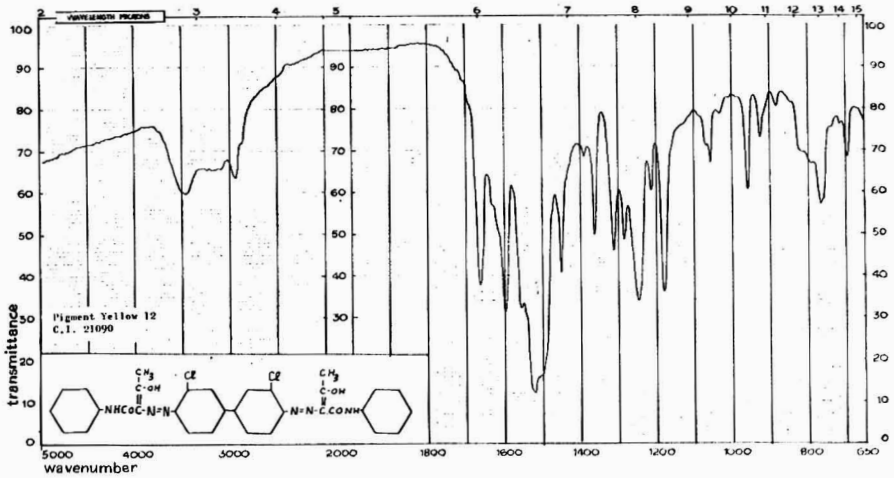
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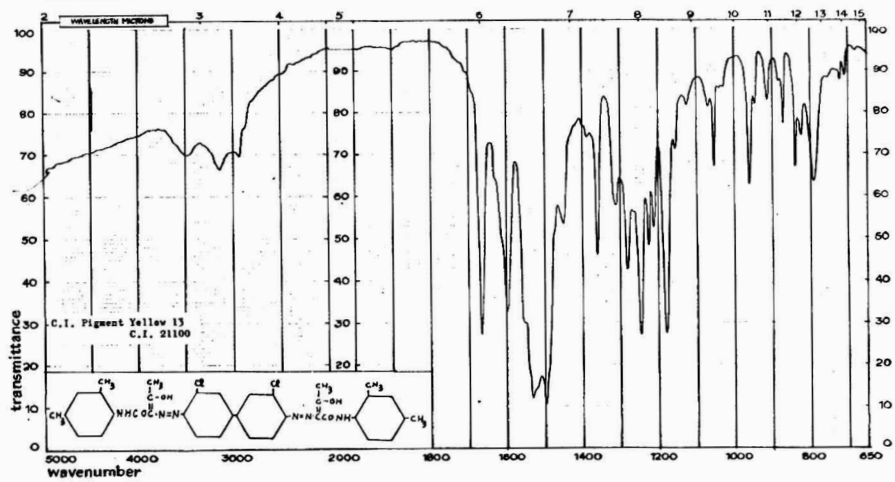
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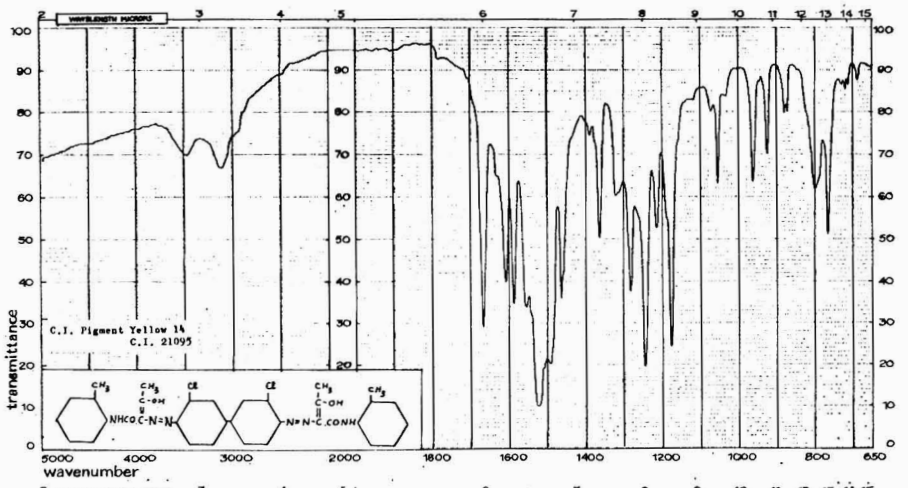
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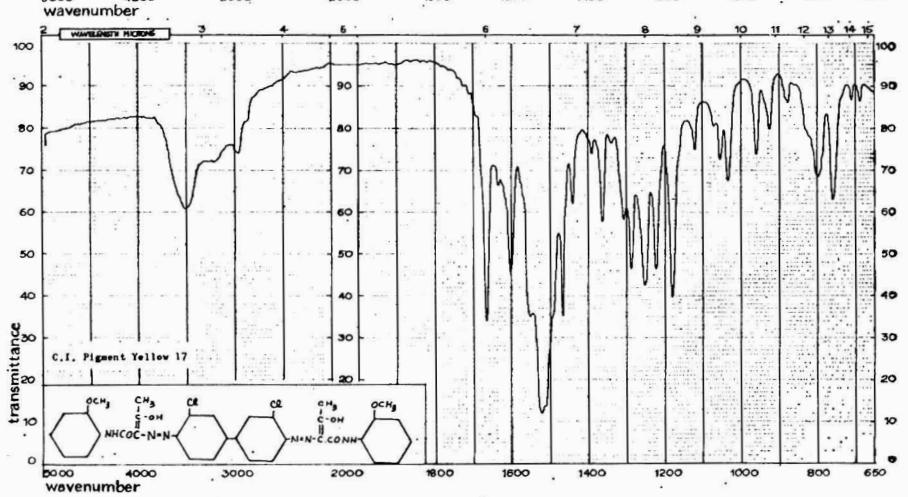
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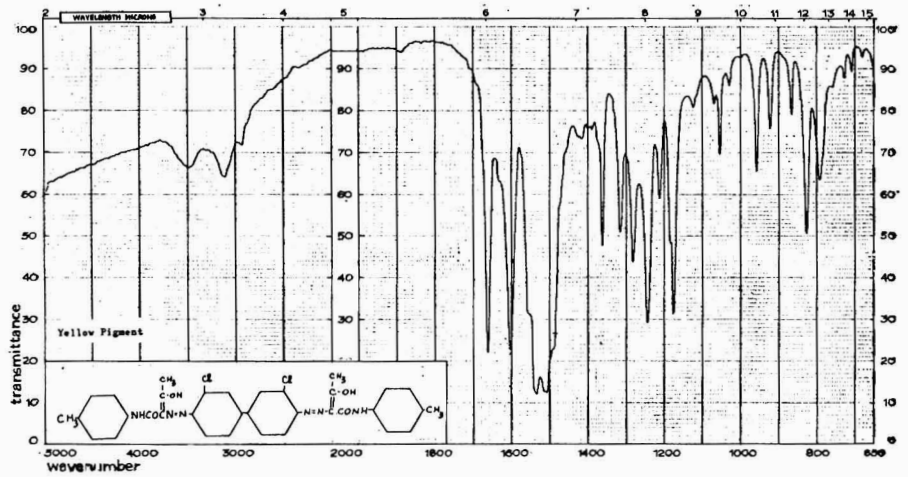
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transmittance
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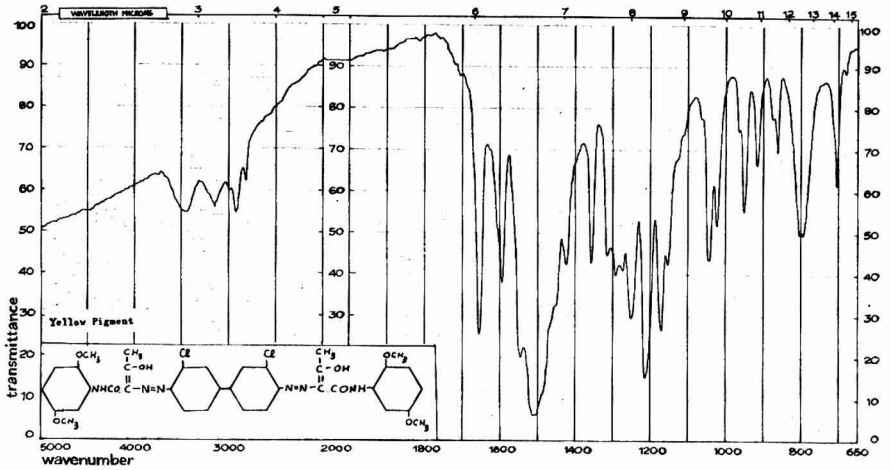
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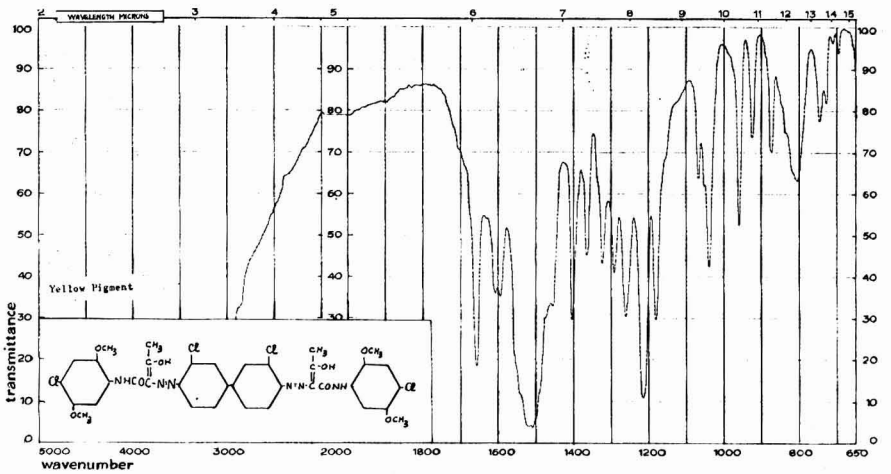
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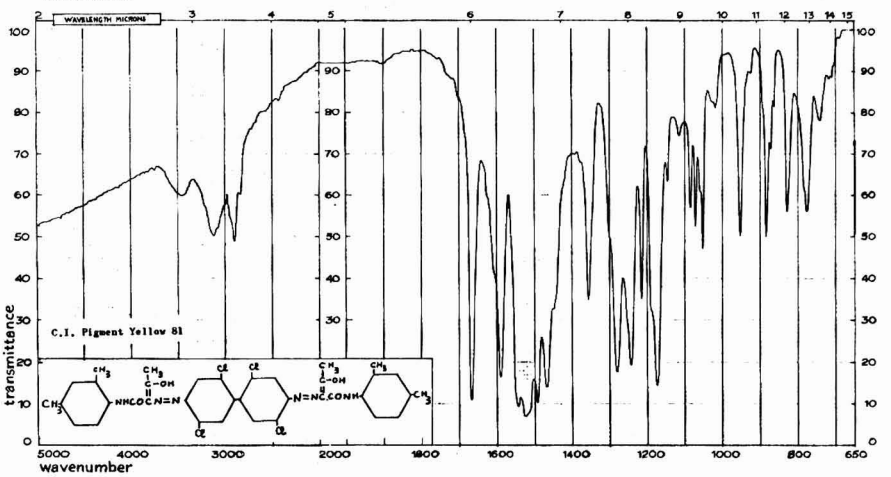
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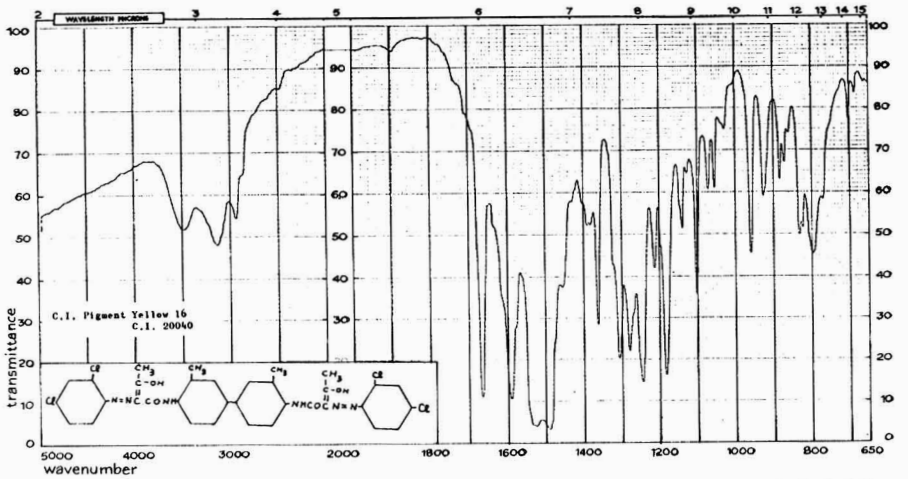
wavenumber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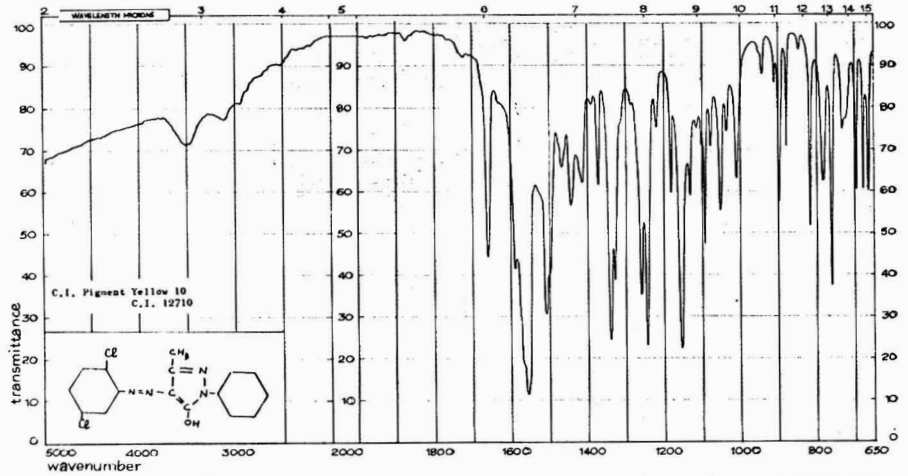
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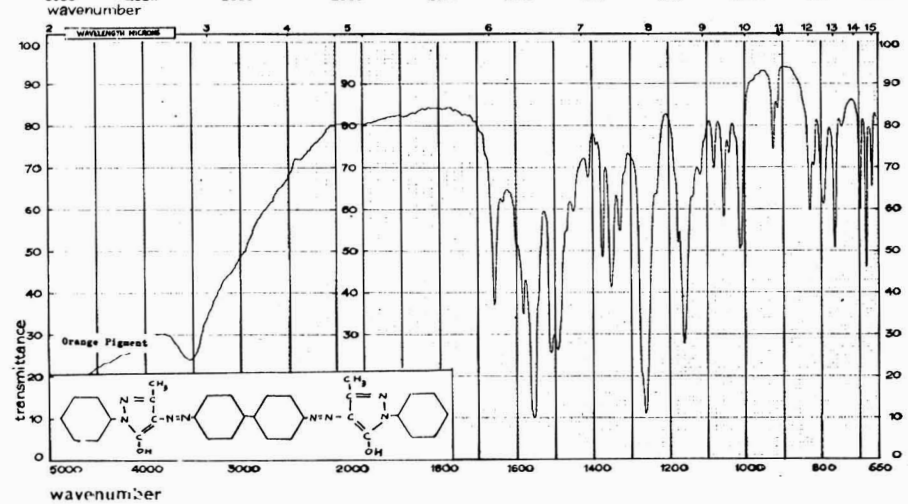
wavenumber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Orange Pigment
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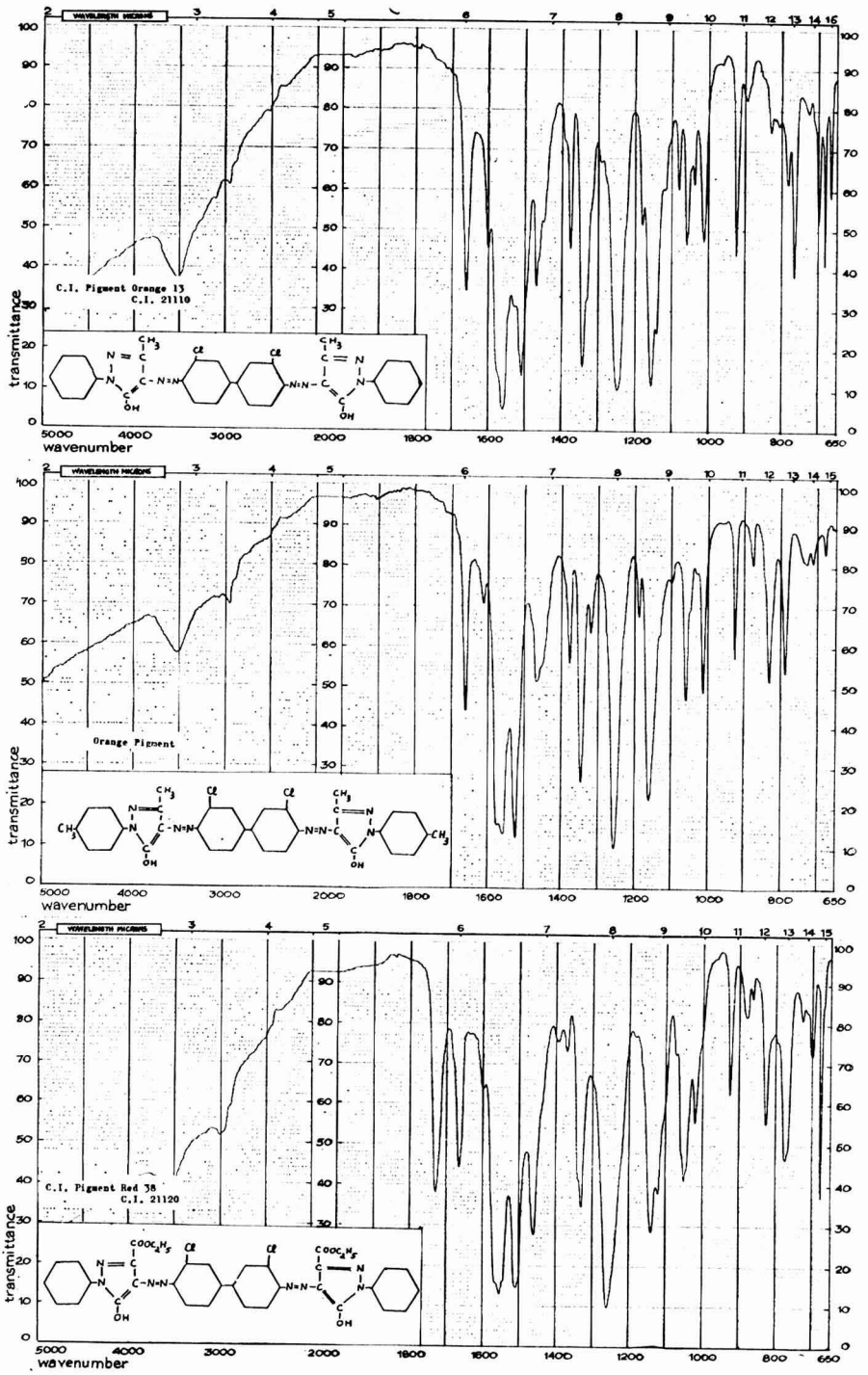
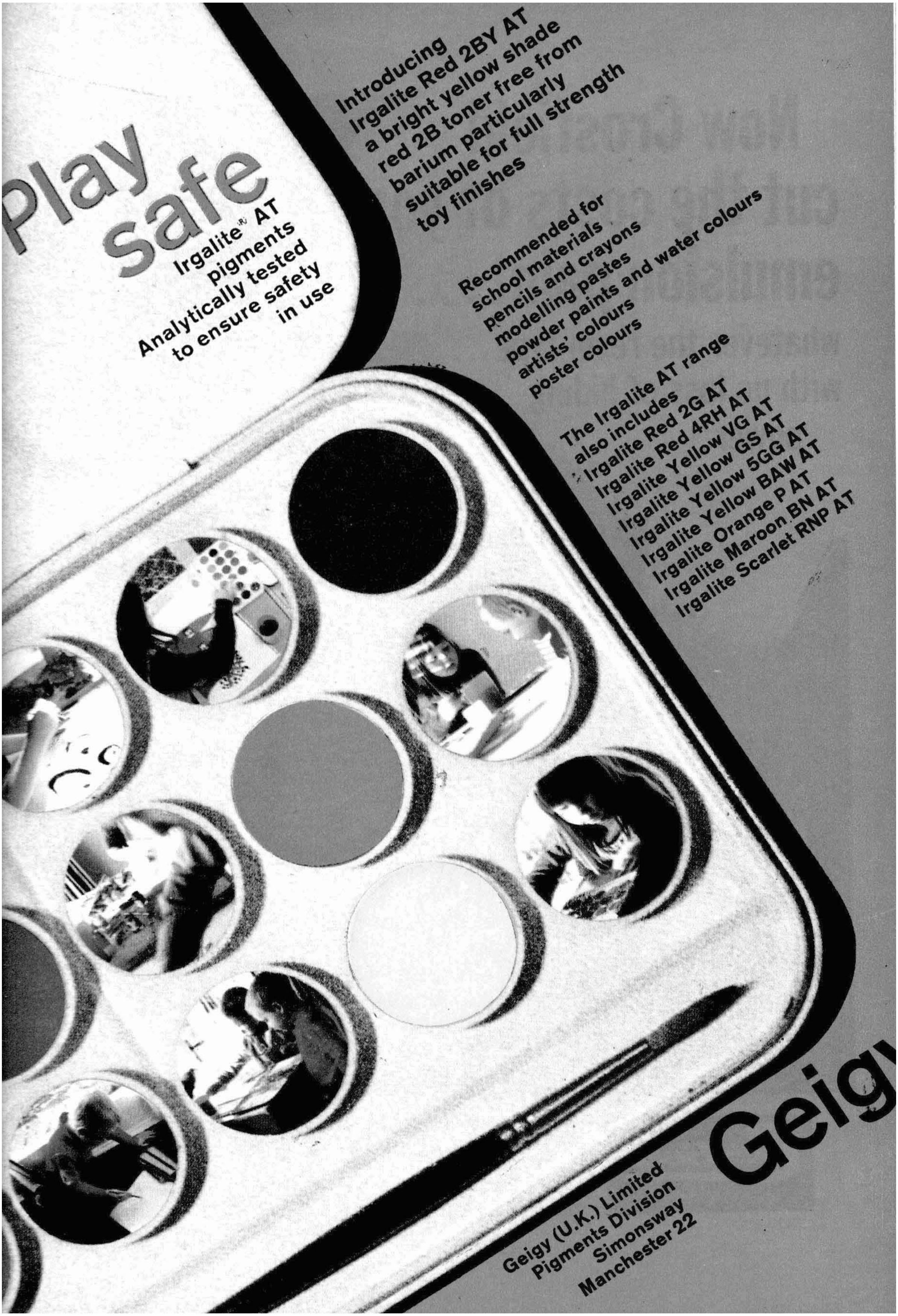

C.I. Pigment Orange 13
C.I. 21110
transmittance
wavenumber
Orange Pigment
transmittance
wavenumber
C.I. Pigment Red 38
C.I. 21120
transmittance
wavenumber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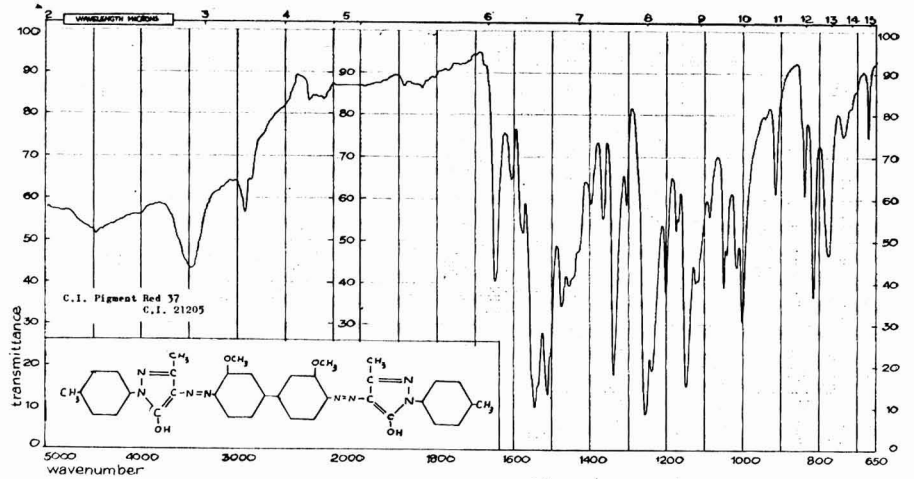
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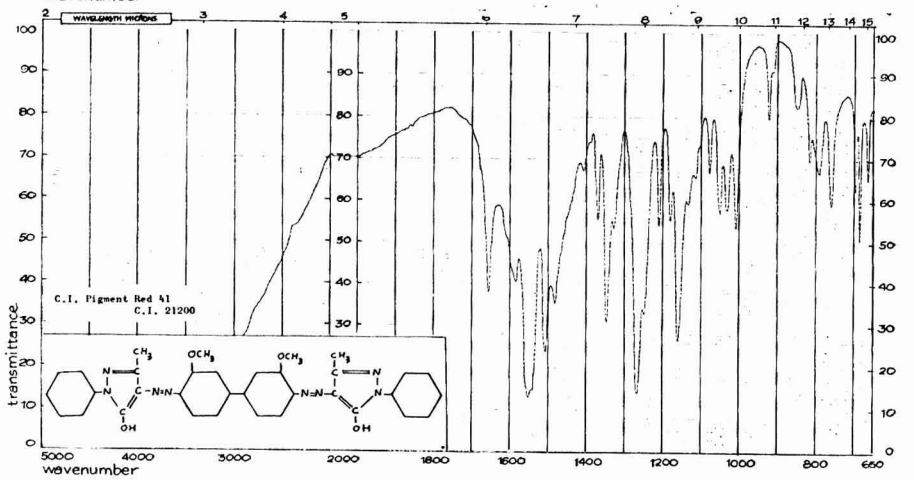
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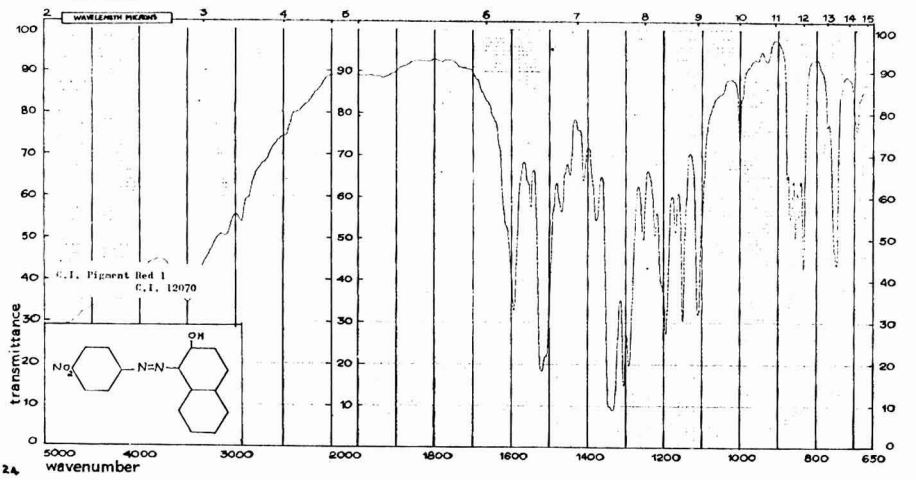
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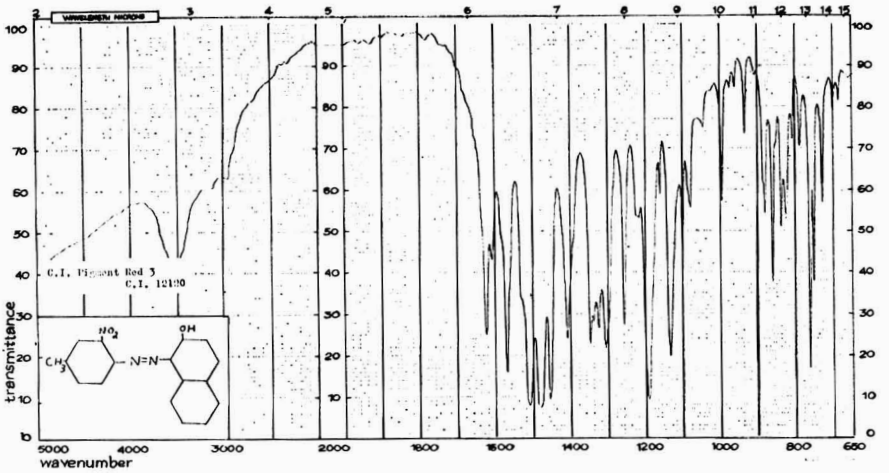
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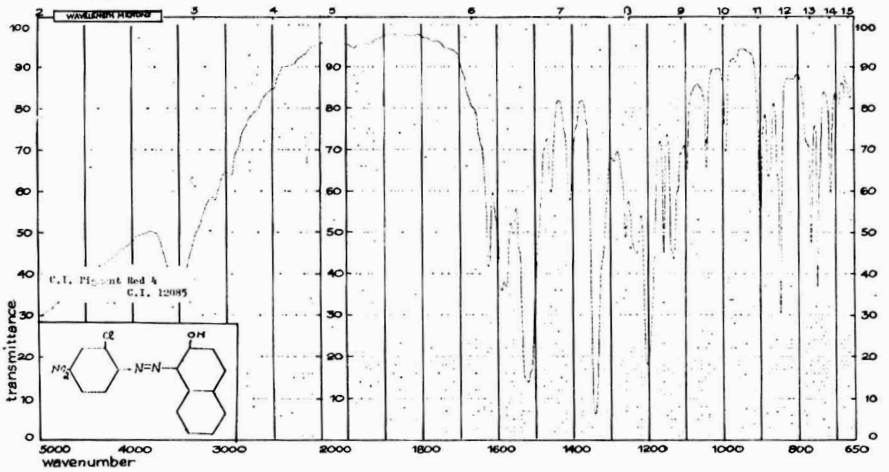
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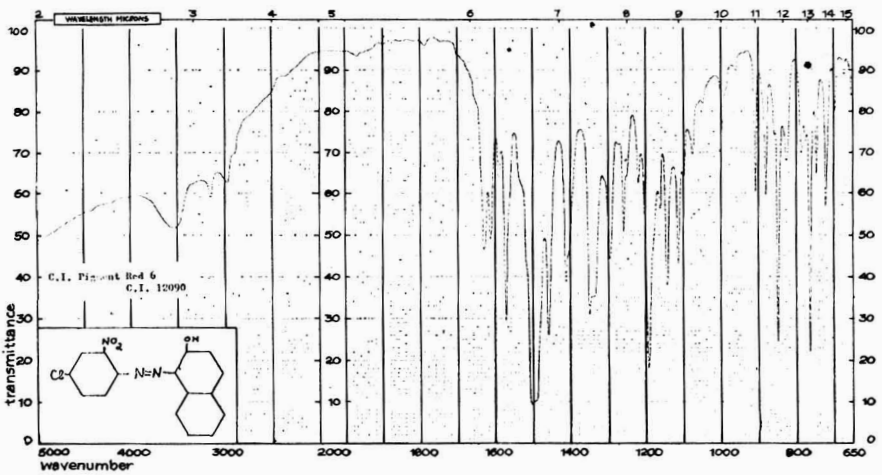
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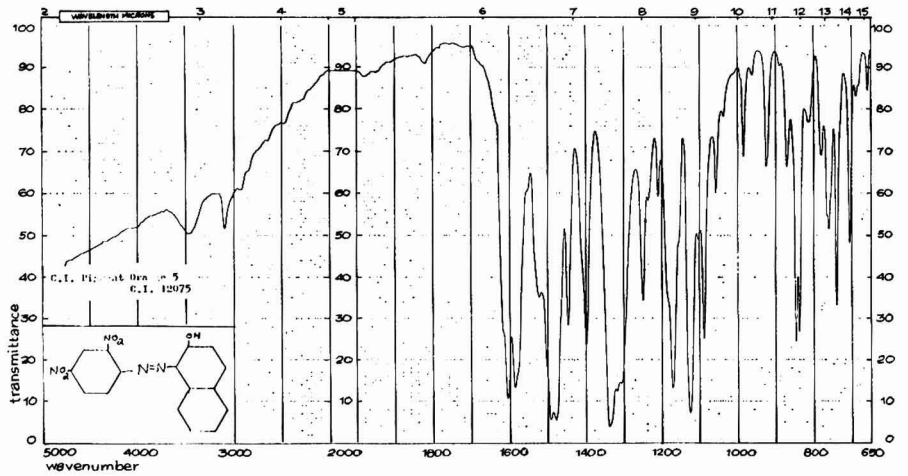
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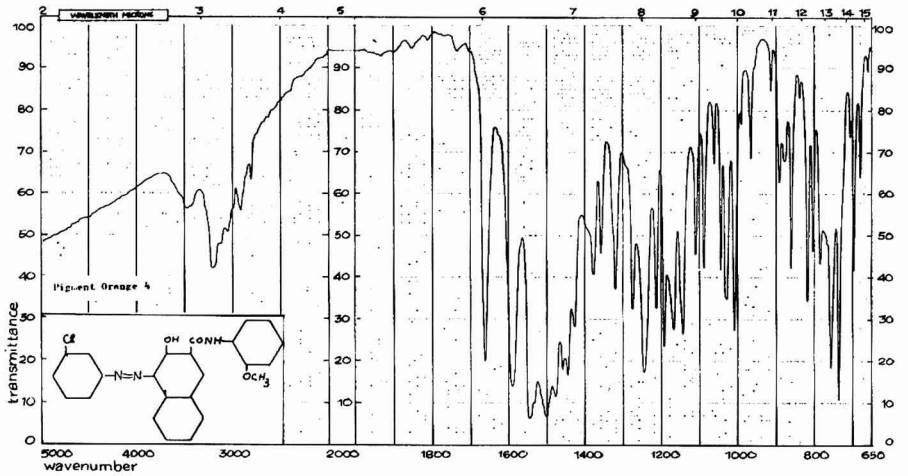
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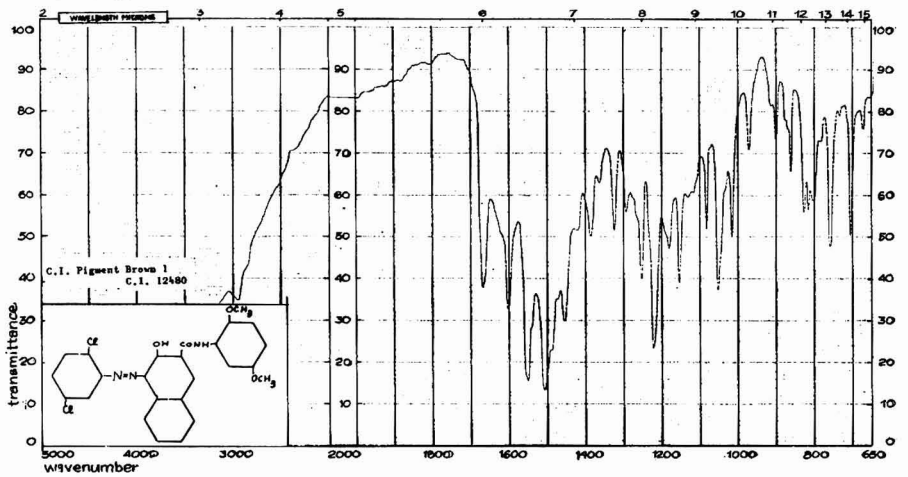
Pigment Orange 4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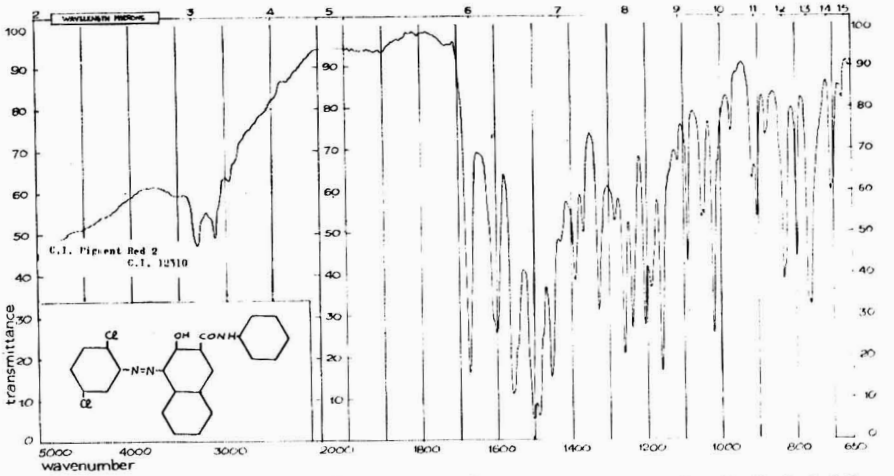
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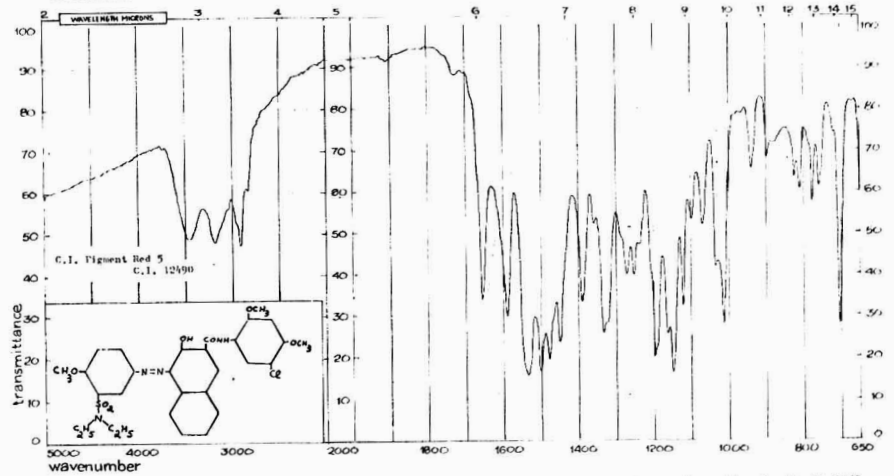
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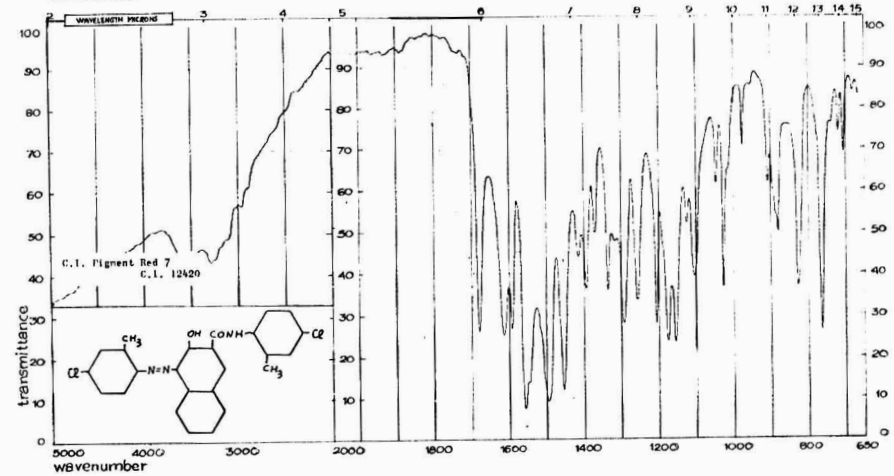
WAVELENGTH MICRONS
C.I. Pigment Red 7
C.I. 12420
transmittance
wavenumber

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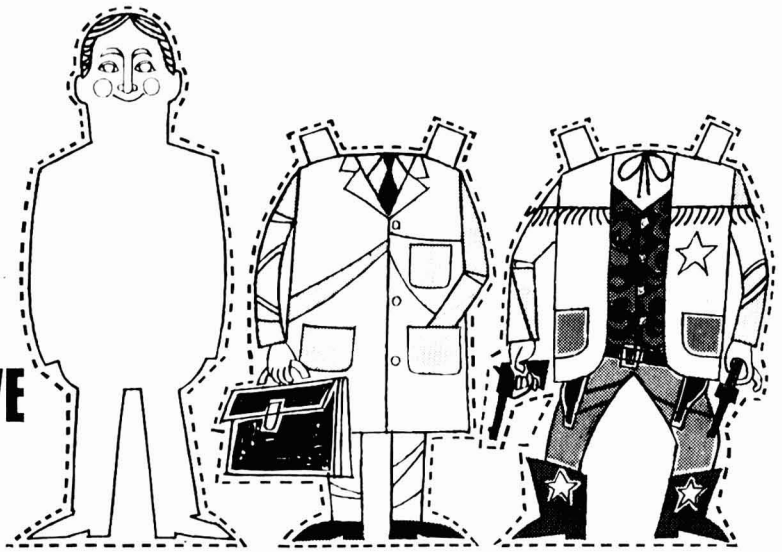

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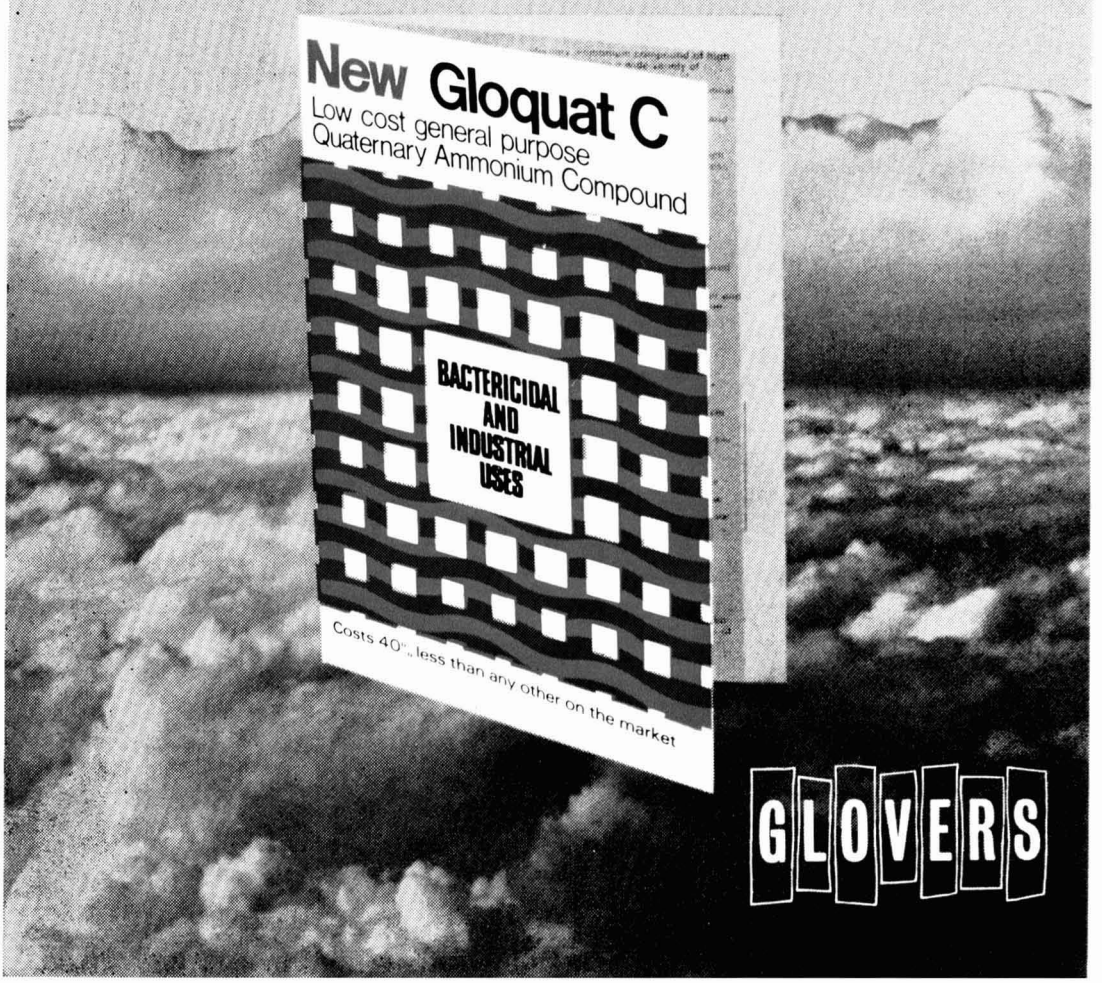

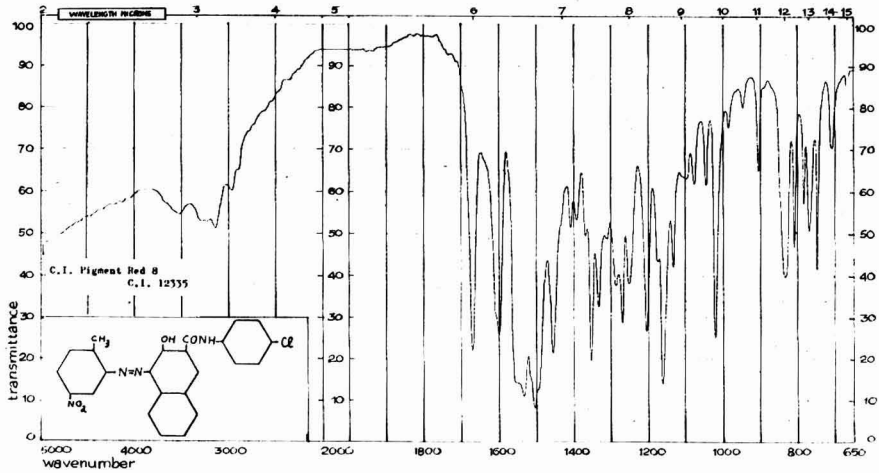
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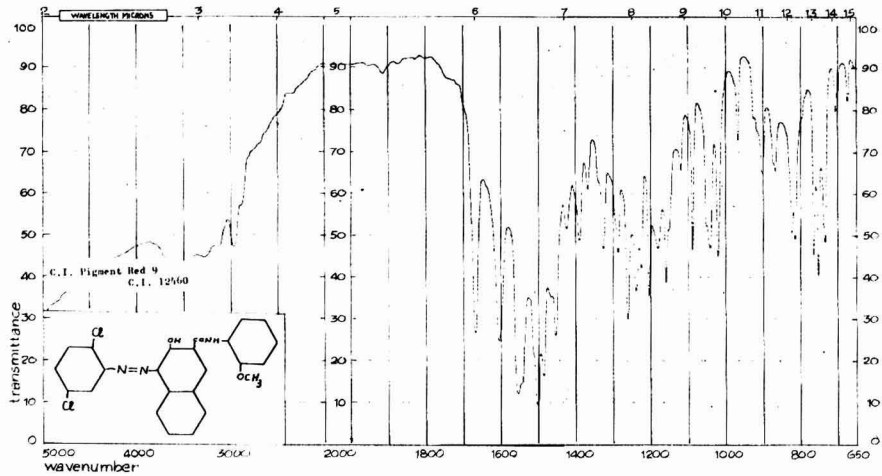
transmittance
wavenumber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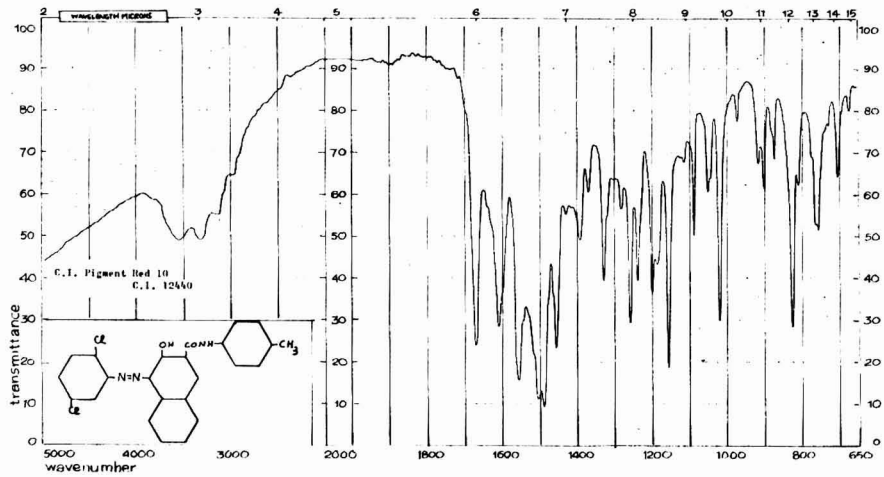
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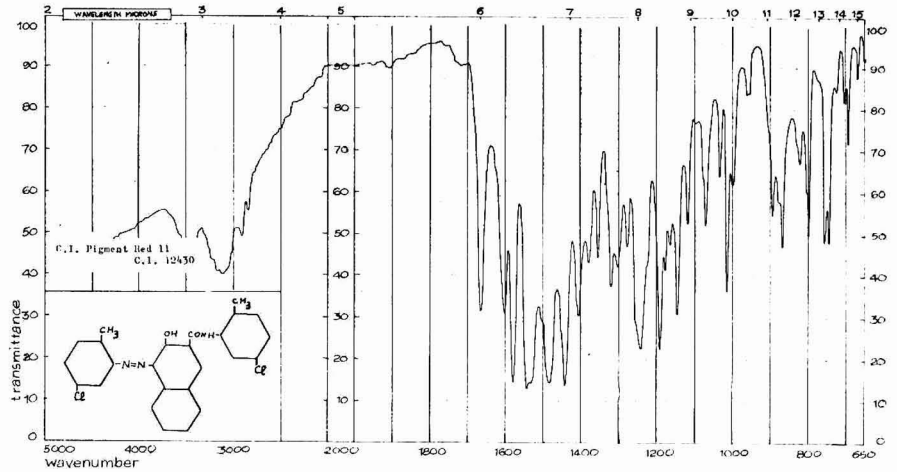
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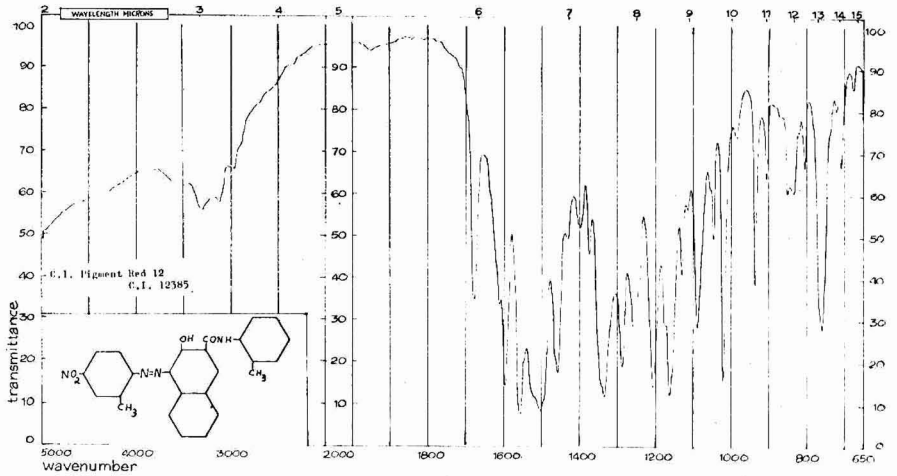
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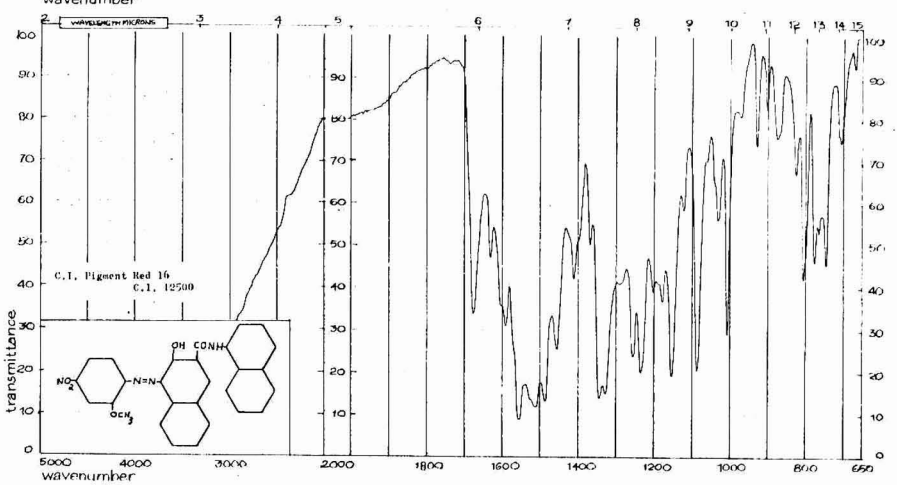
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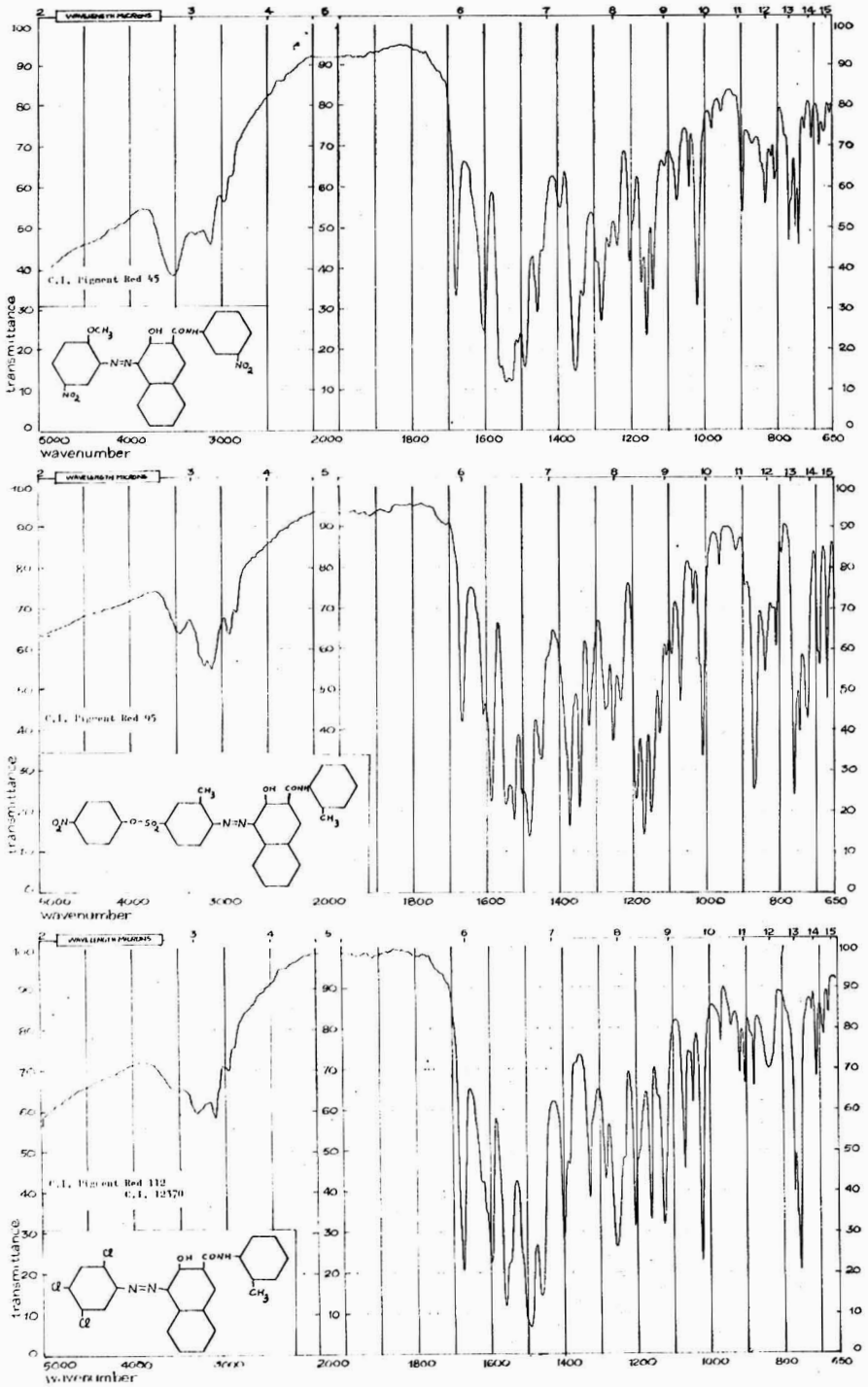
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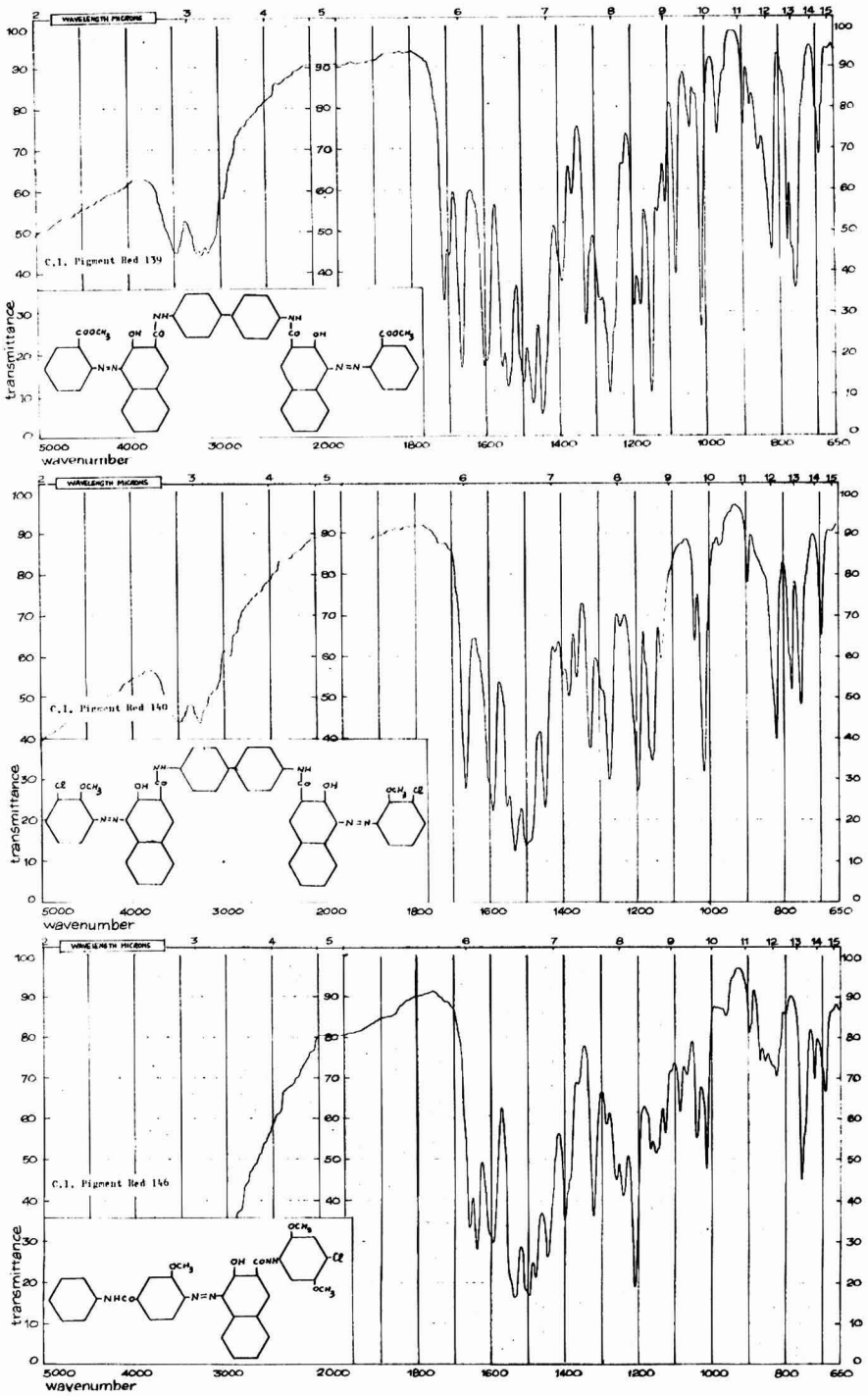
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wavenumber
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transmittance
wavenumber
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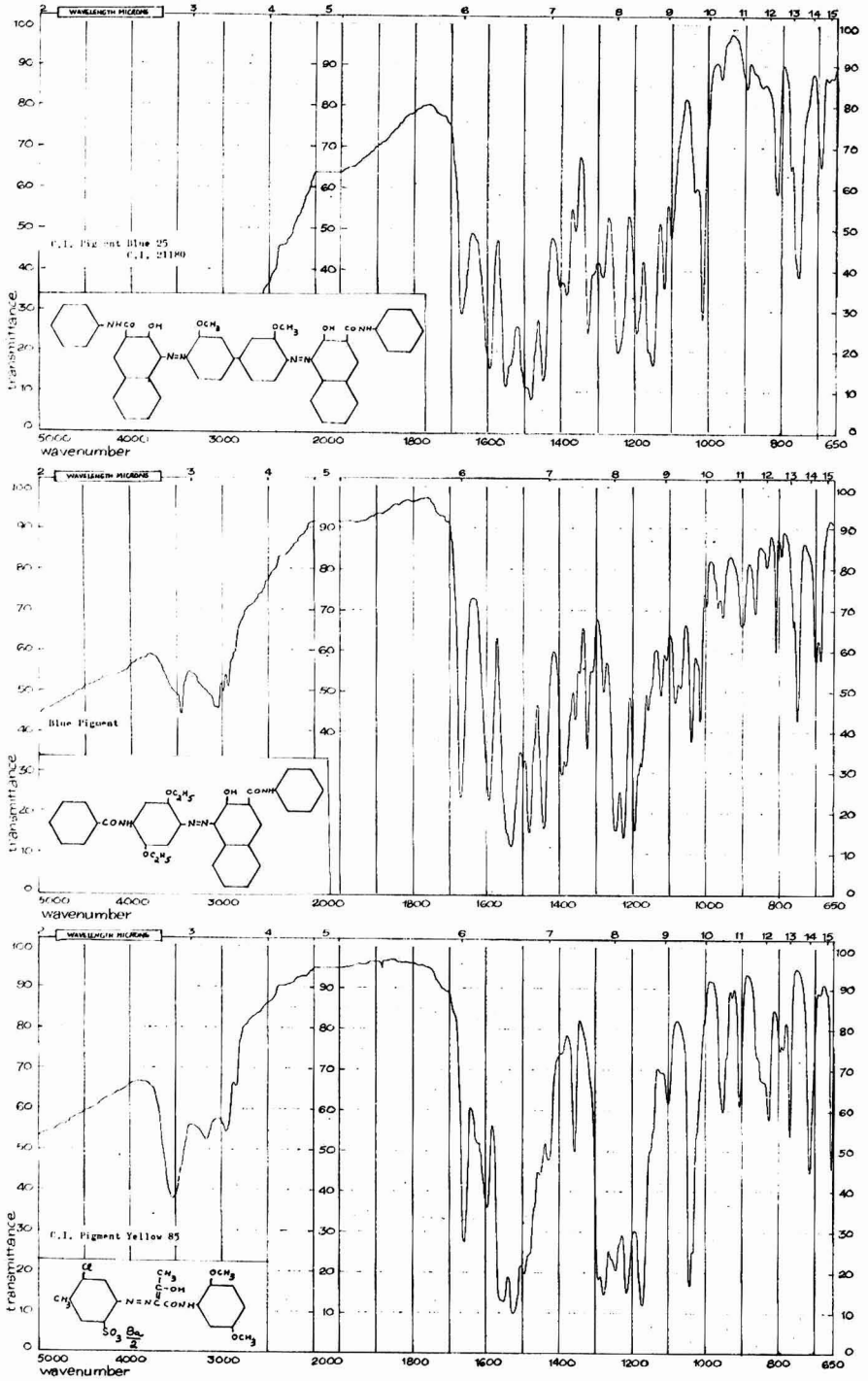
transmittance
wavenumber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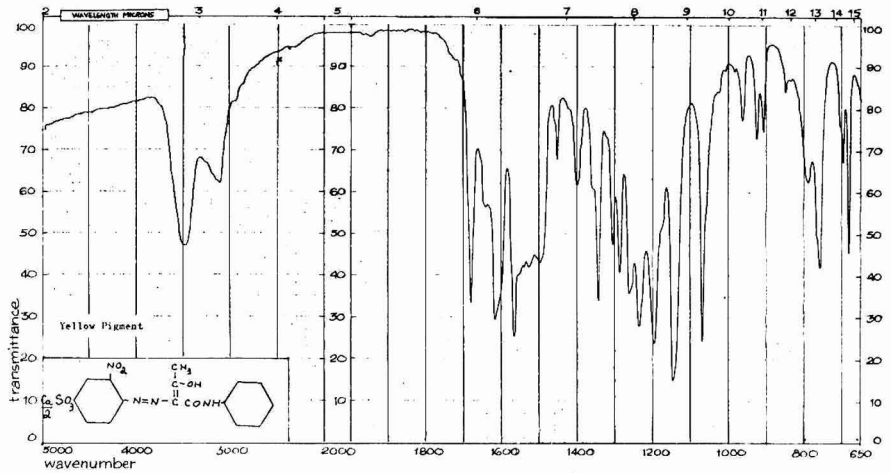
wavenumber
Blue Pigment
C.I. Pigment Yellow 85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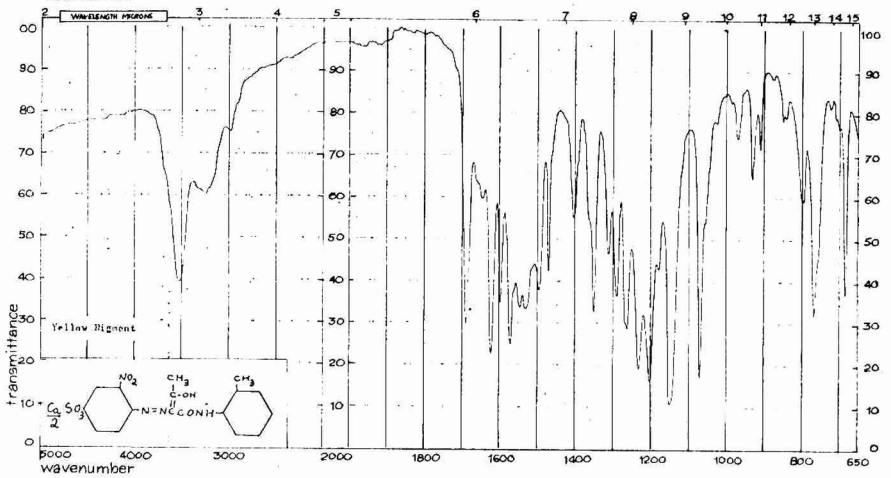
Yellow Pigment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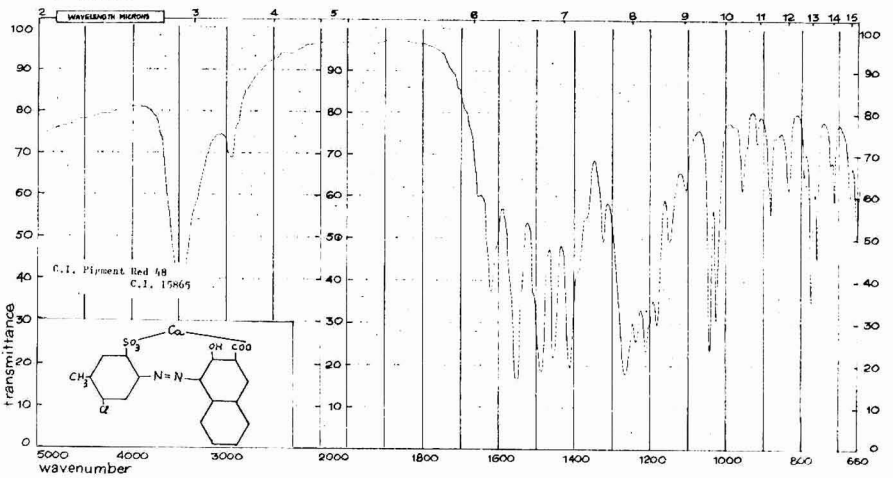
Yellow Pigment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wavenumber
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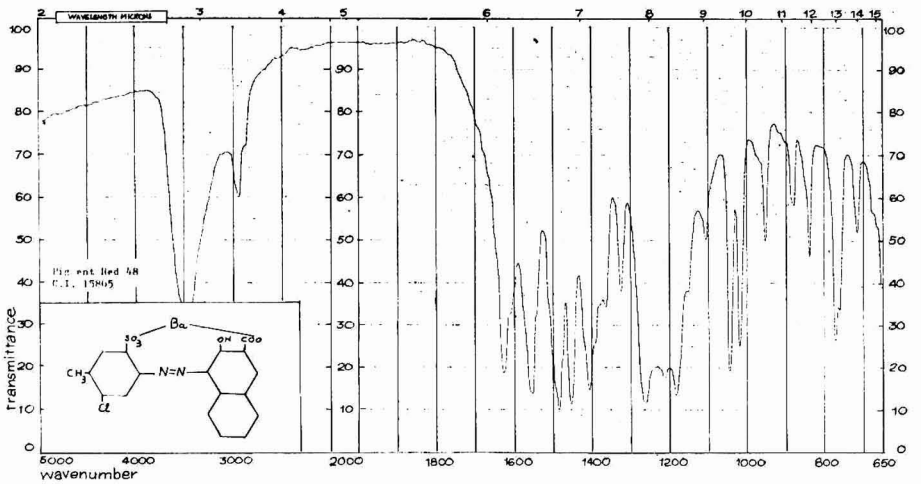
C.I. 15865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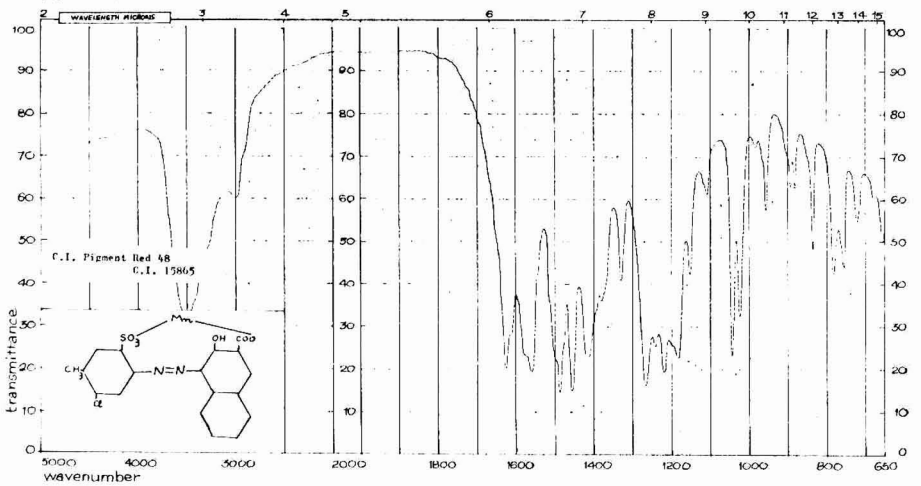
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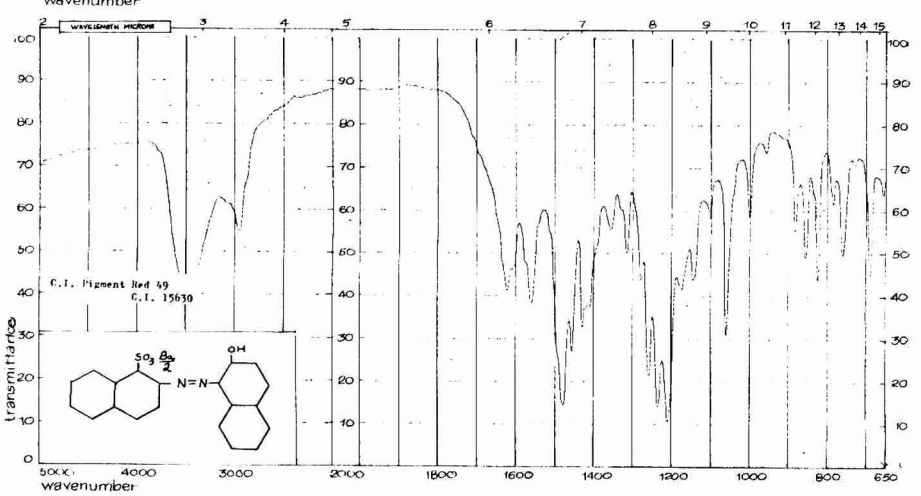
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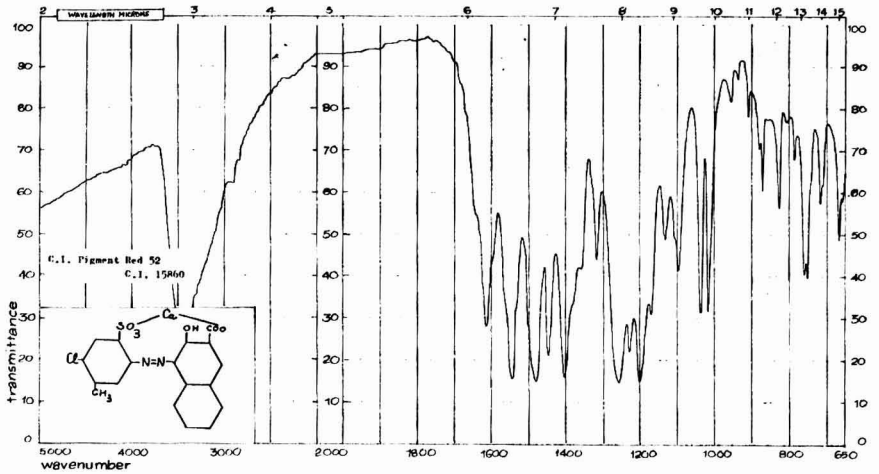
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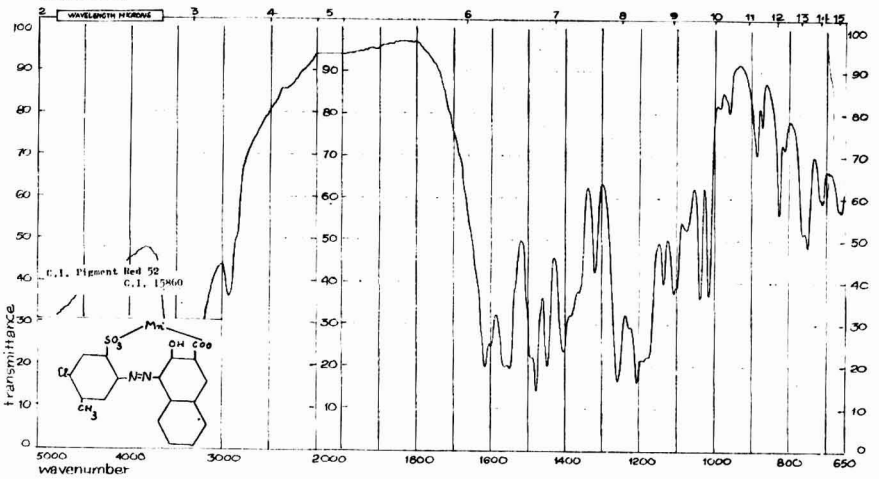
wavenumber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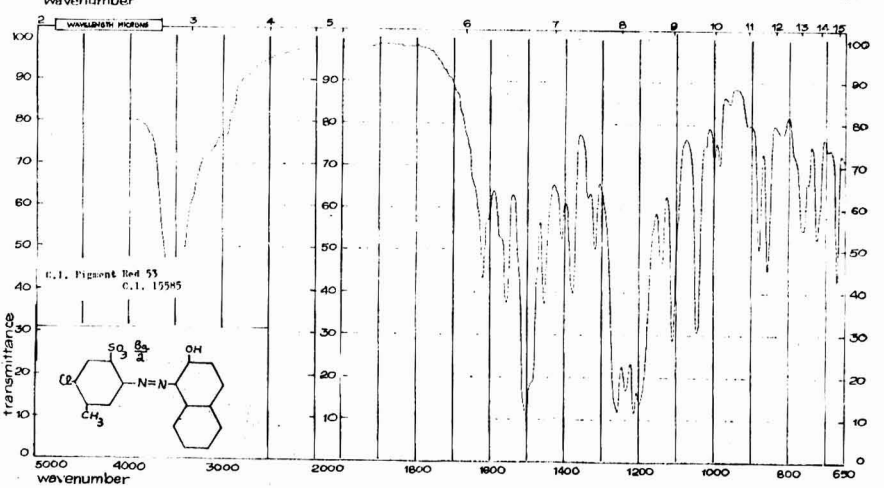
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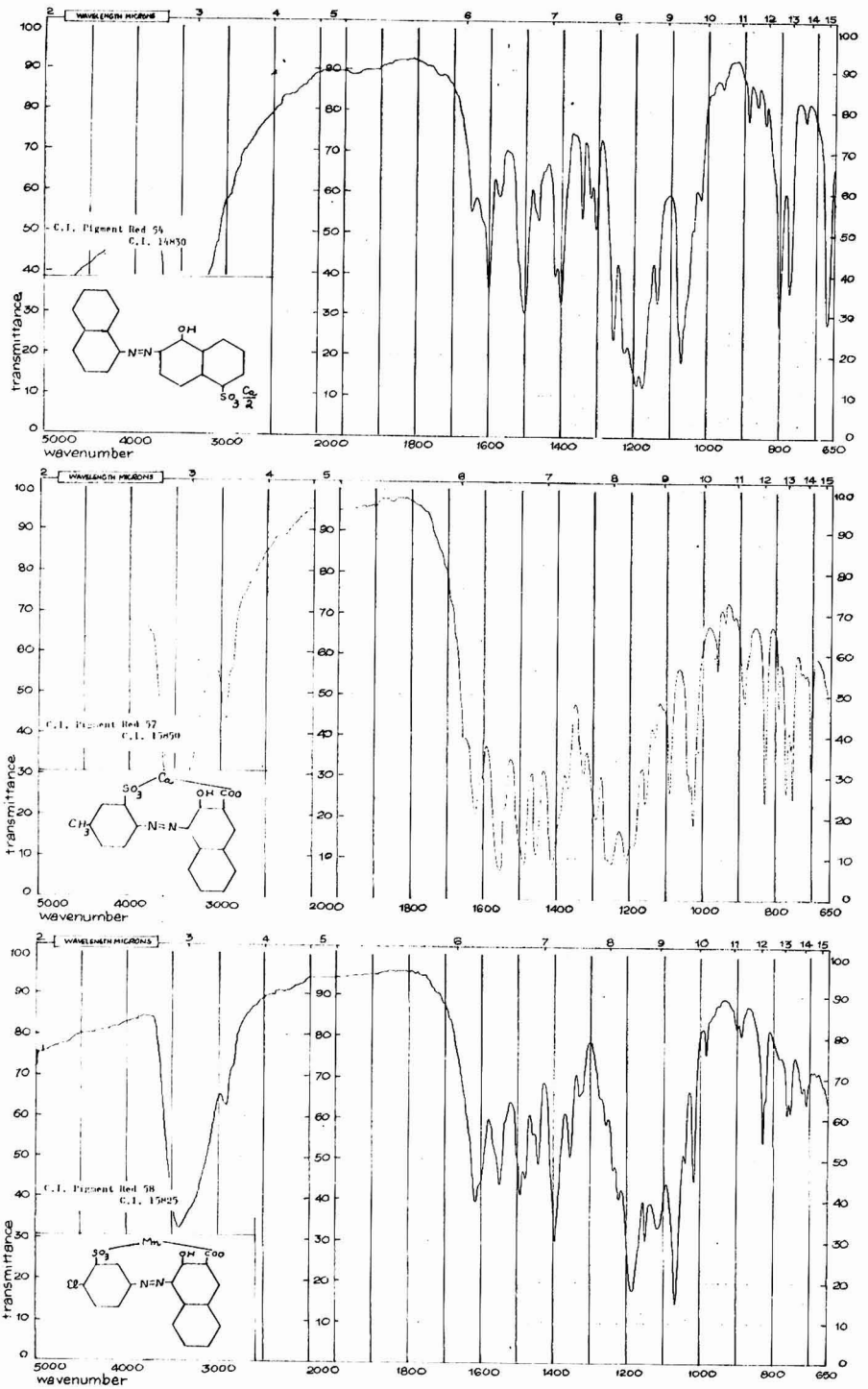
wavenumber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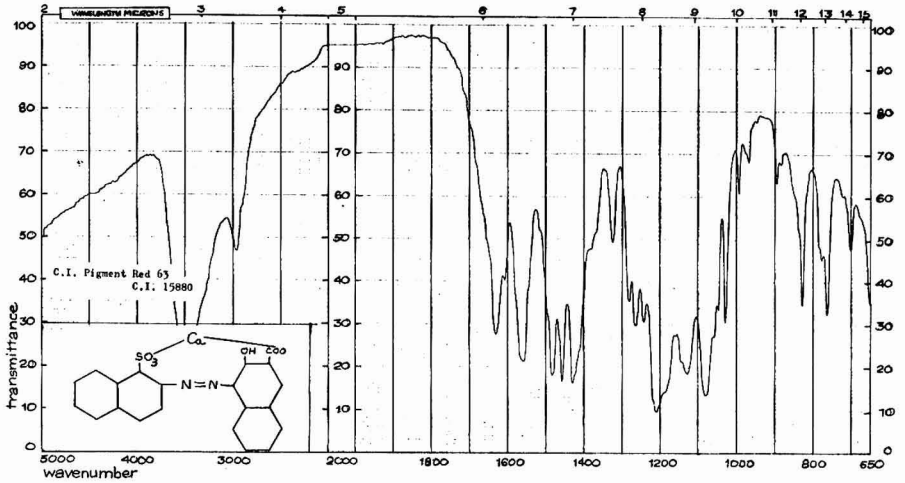
C.I. 15825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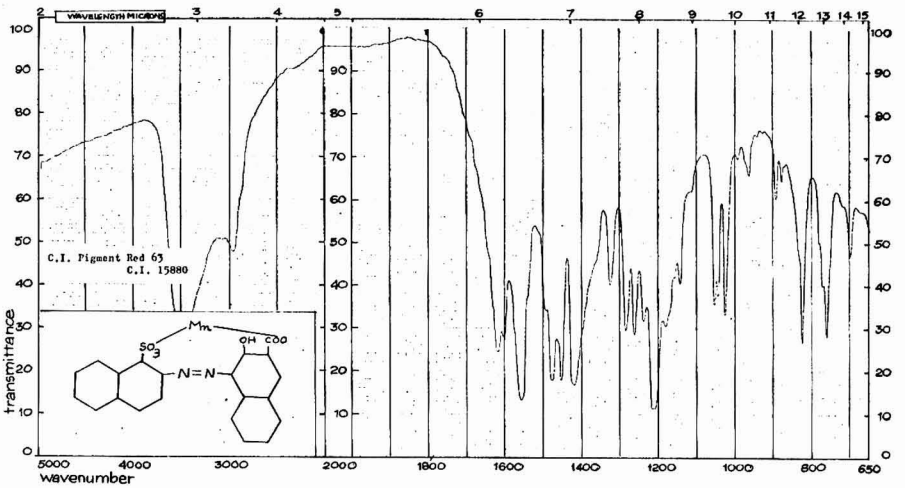
transmittance
wavenumber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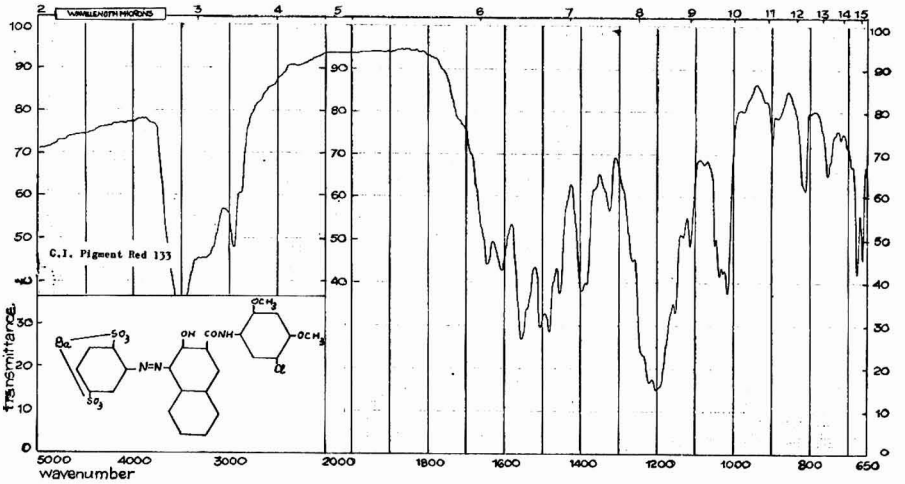
C.I. 15880
transmittance
wavenumber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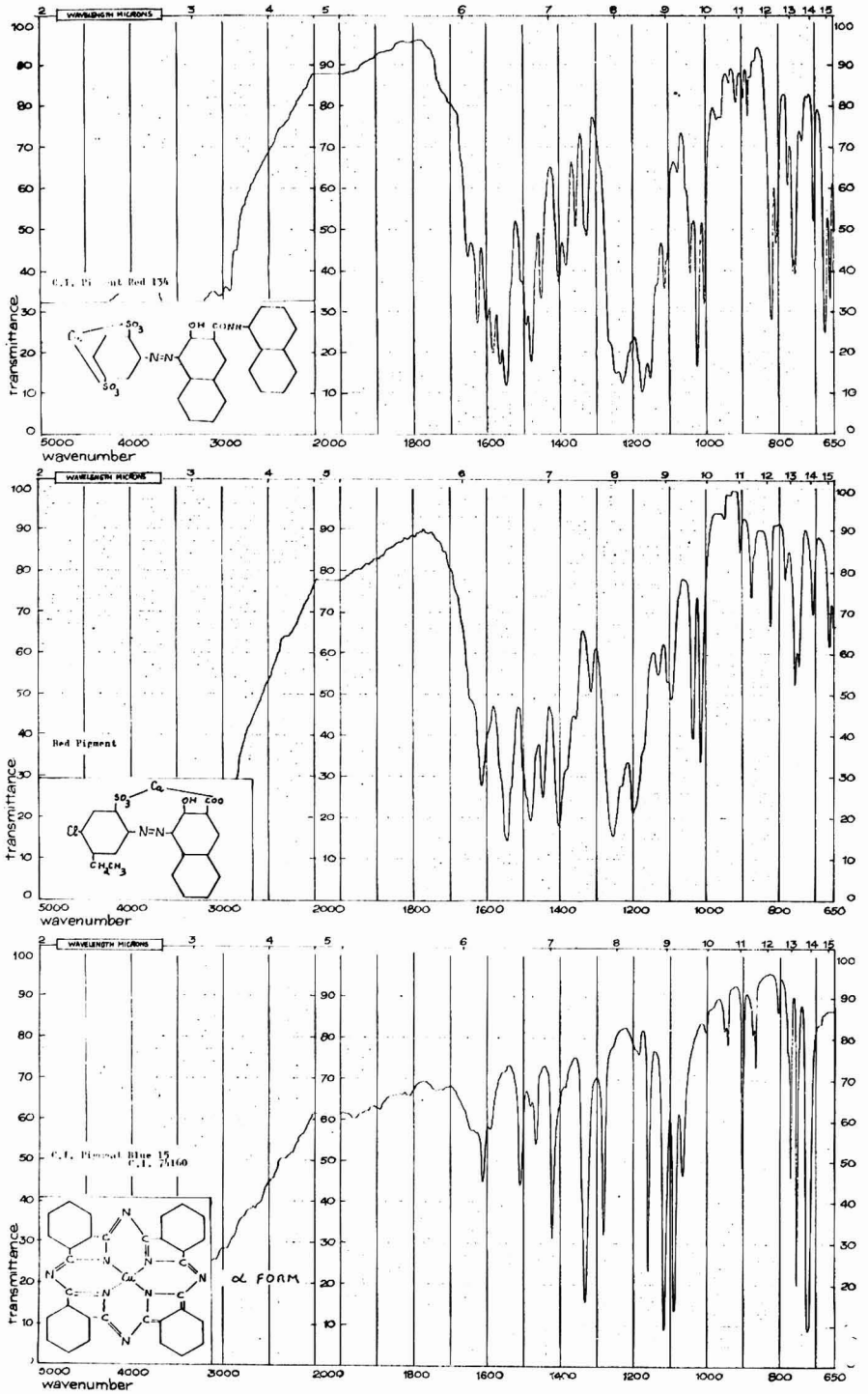
transmittance
wavenumber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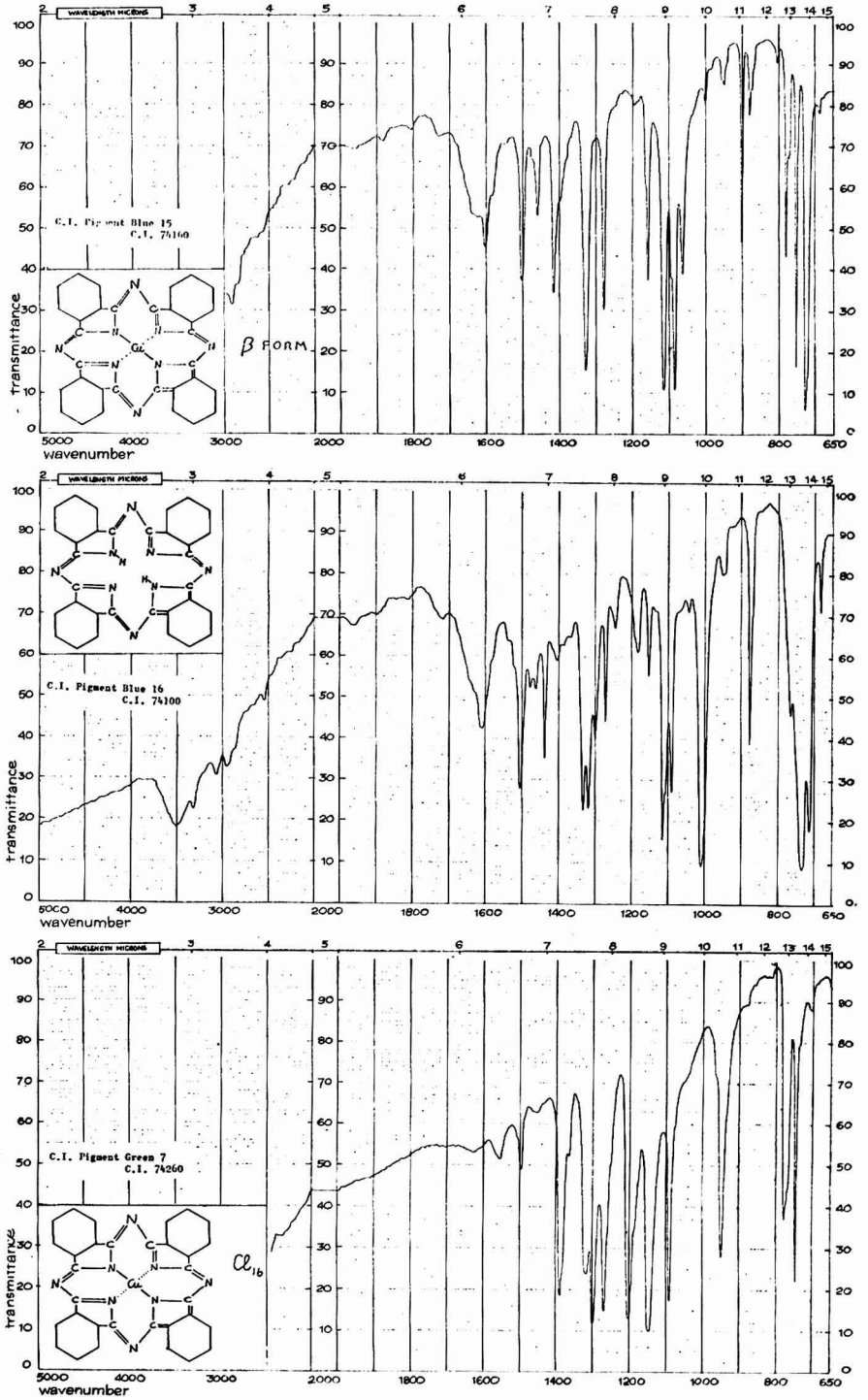
transmittance
wavenumber
C.I. Pigment Red 134
Red Pigment
C.I. Pigment Blue 15
C.I. 74160
α FORM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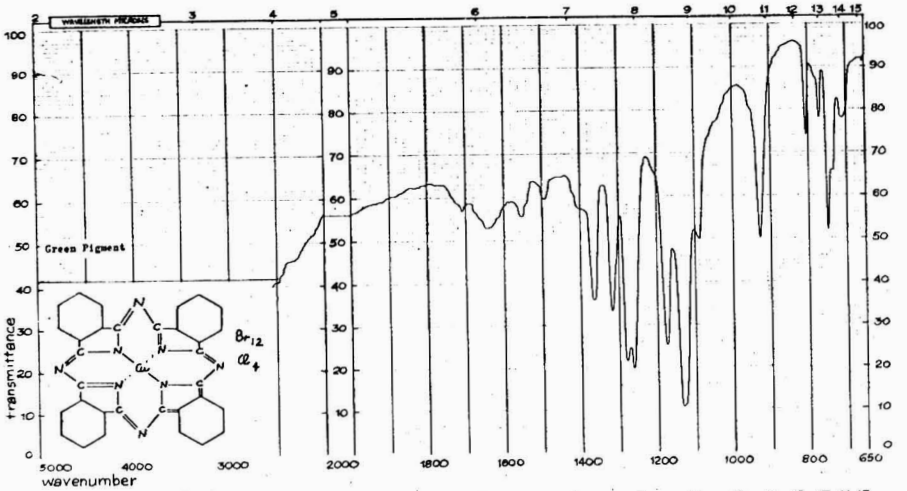
C.I. 74160
β FORM
transmittance
wavenumber
C.I. Pigment Blue 16
C.I. 74100
transmittance
wavenumber
C.I. Pigment Green 7
C.I. 74260
Cl16
transmittance
wavenumber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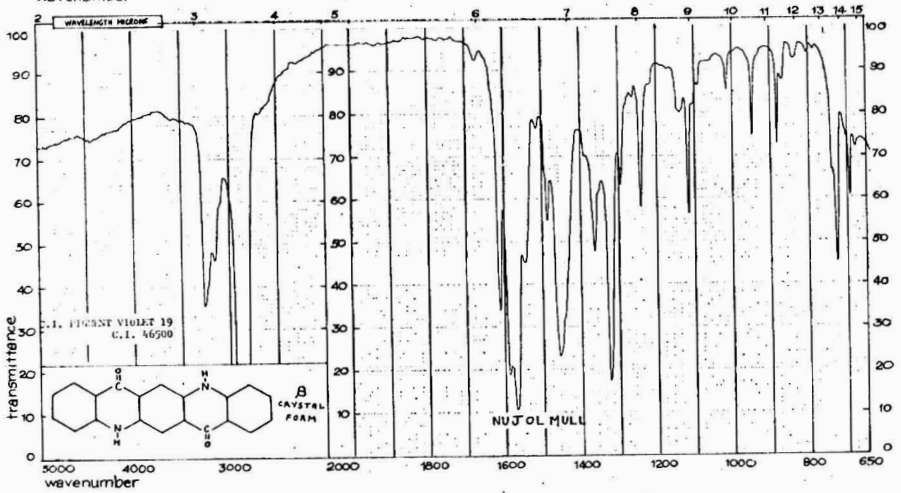
Green Pigment
transmittance
wavenumber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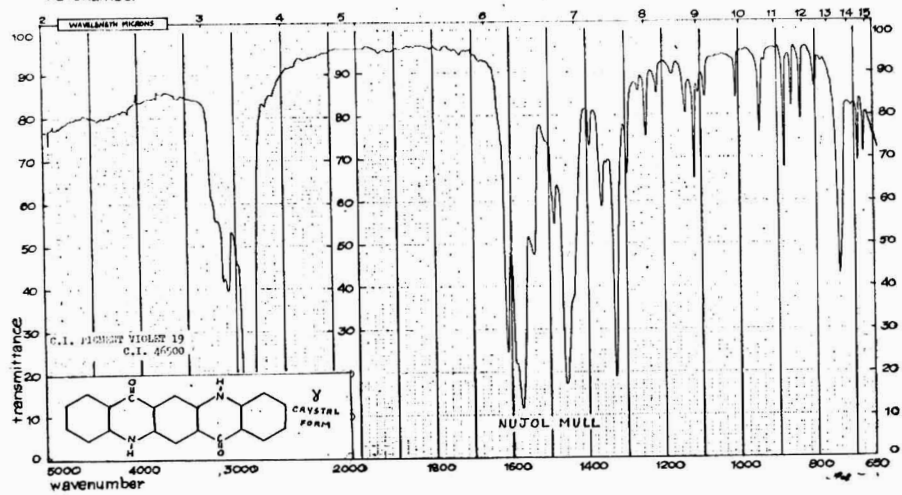
C.I. PIGMENT VIOLET 19
C.I. 46500
β CRYSTAL FORM
NUJOL MULL
transmittance
wavenumber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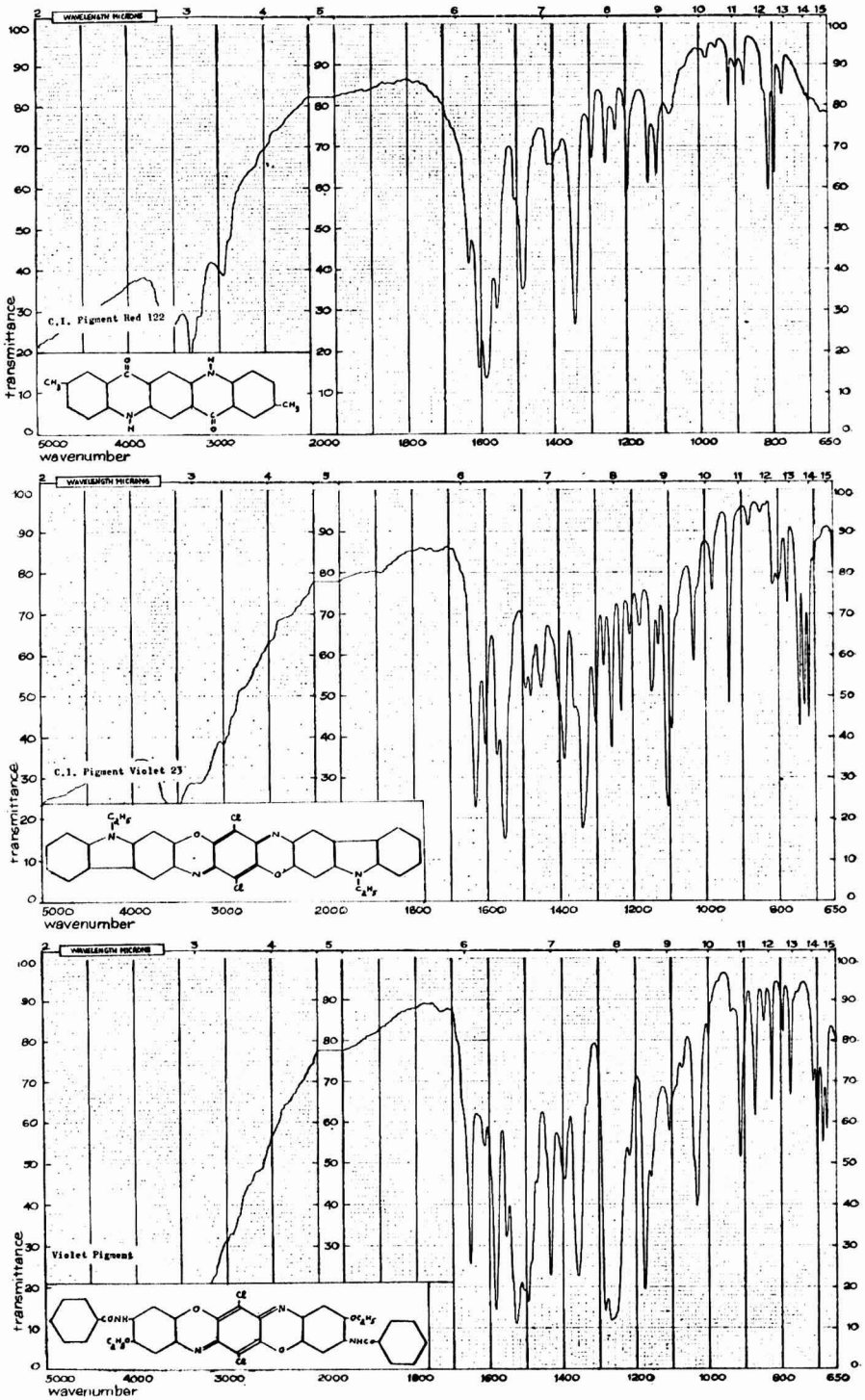
C.I. 46500
γ CRYSTAL FORM
NUJOL MULL
transmittance
wavenumber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transmittance
wavenumber
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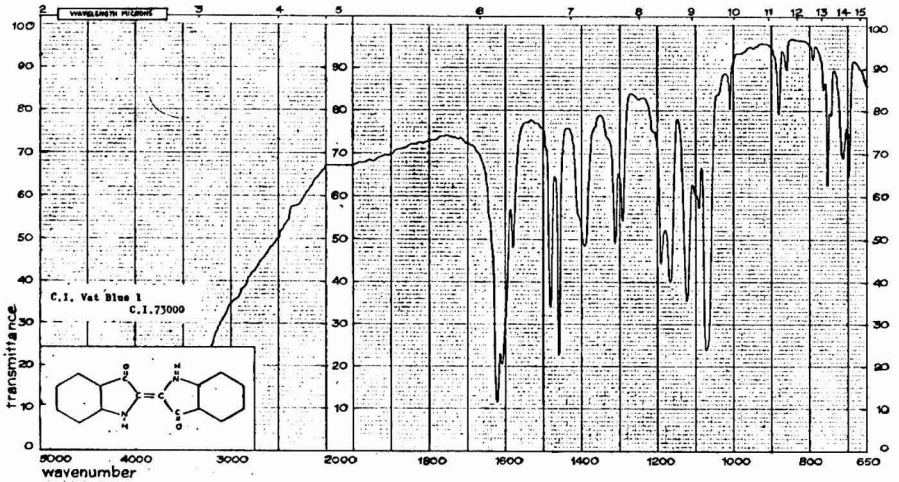
C.I. Pigment Violet 23
Violet Pigment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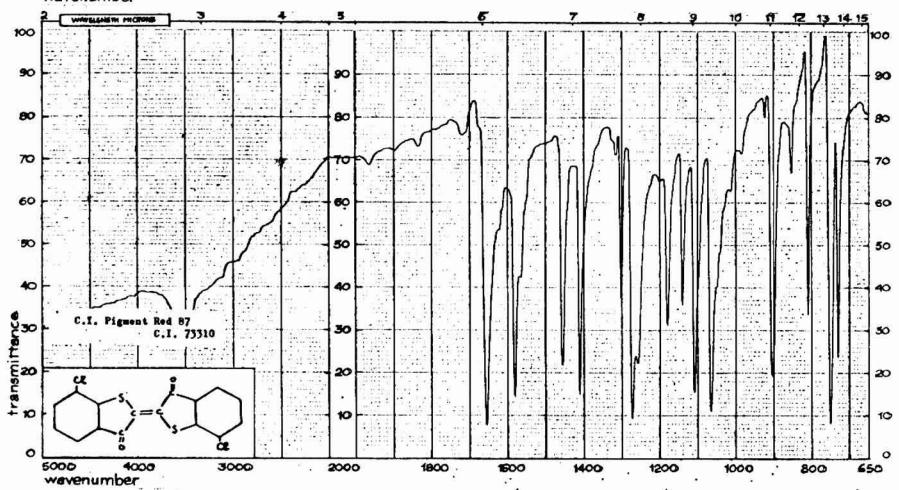
C.I.73000
transmittance
wavenumber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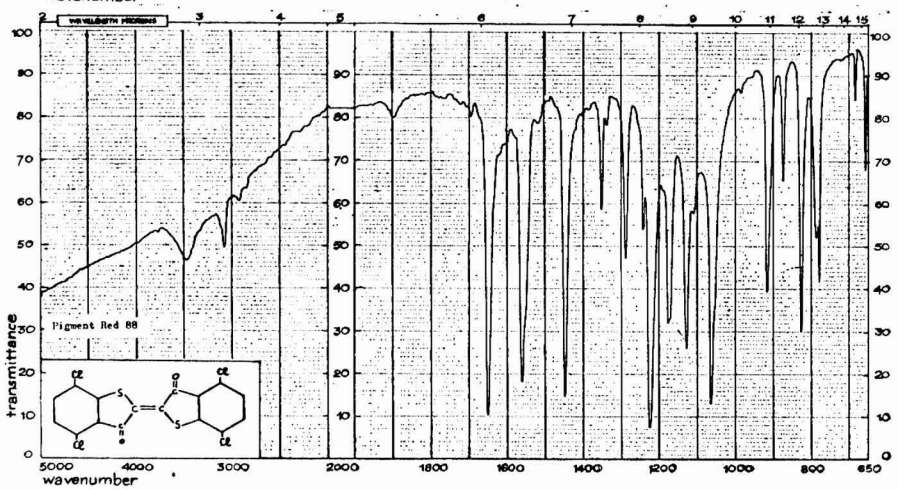
C.I. 73310
transmittance
wavenumber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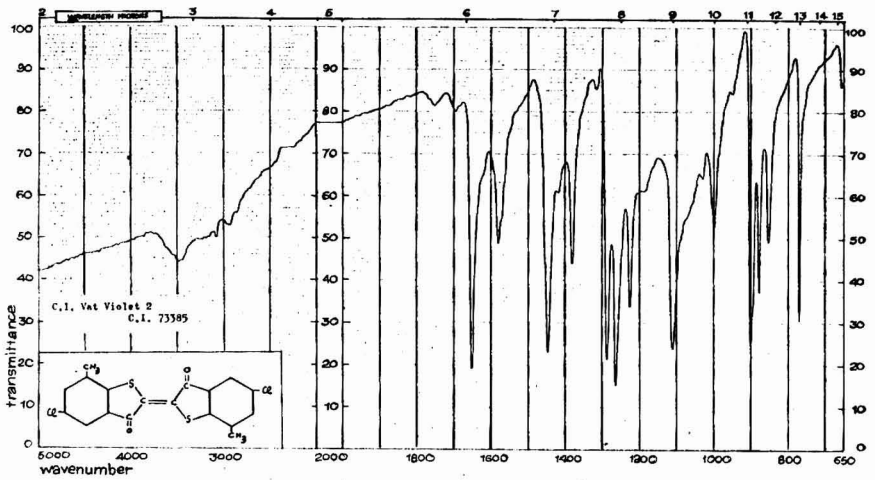
wavenumber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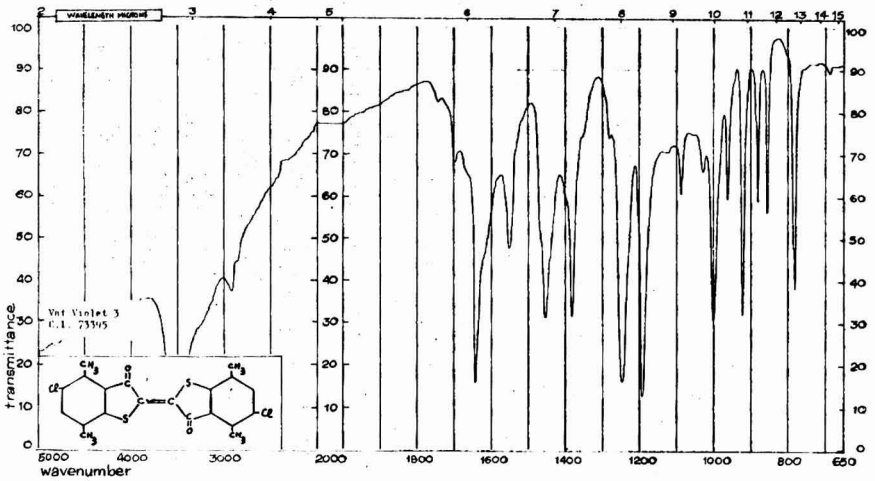
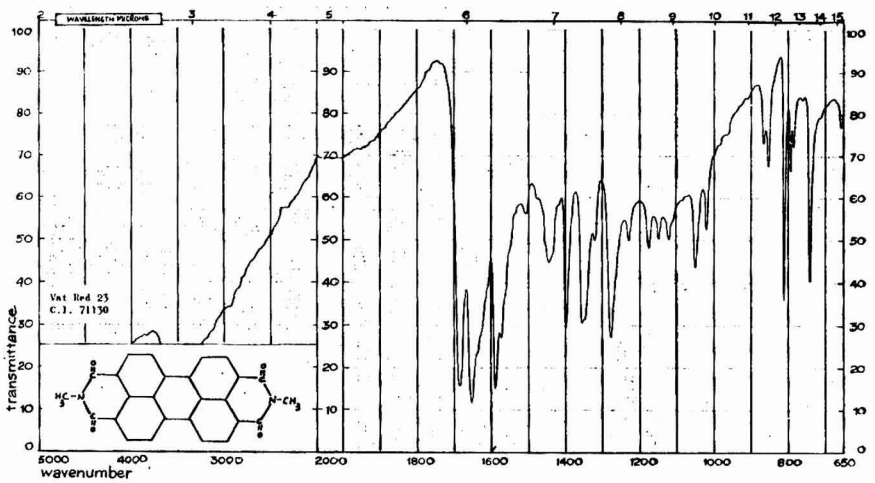
C.I. 73385
transmittance
wavenumber


Vat Violet 3
C.I. 73395
transmittance
wavenumber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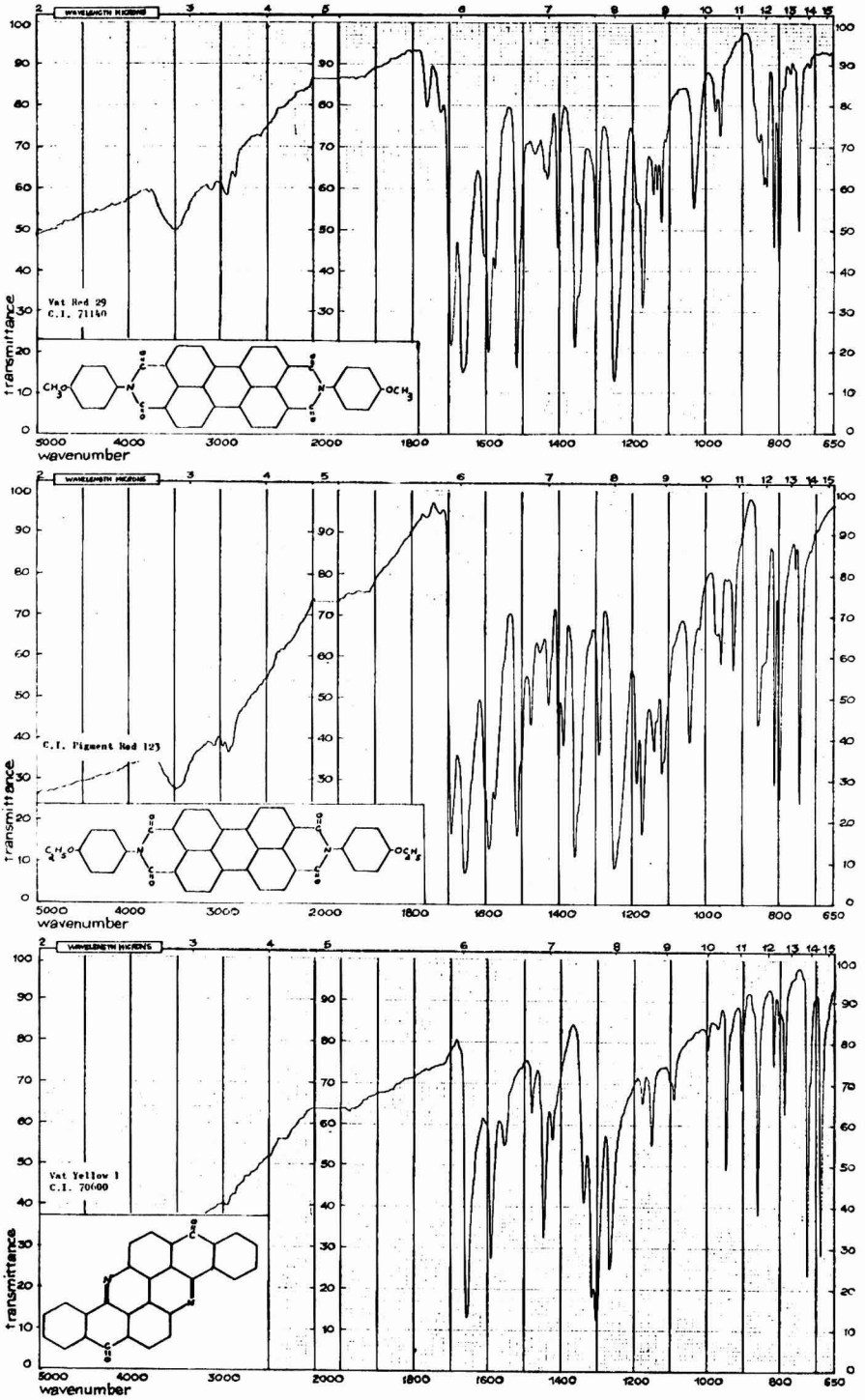
C.I. 71130
transmittance
wavenumber


Vat Red 29
C.I. 71140
transmittance
wavenumber
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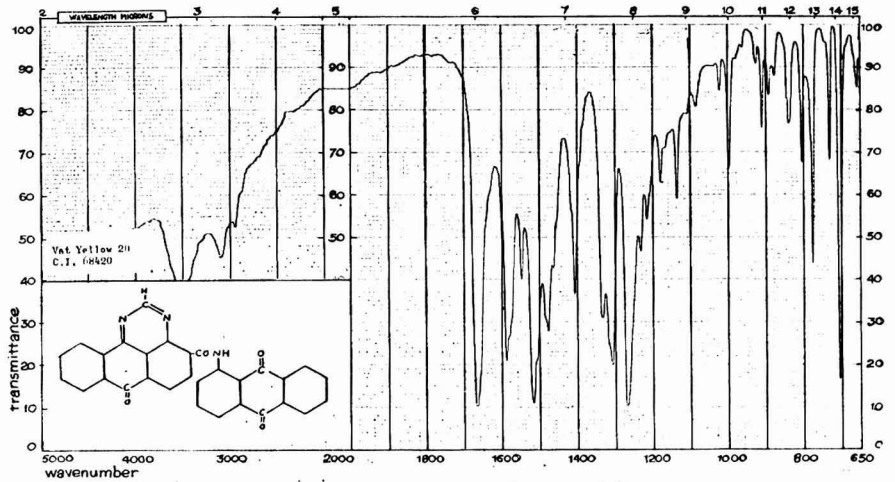
transmittance
wavenumber
Vat Yellow 1
C.I. 70600
transmittance
wavenumber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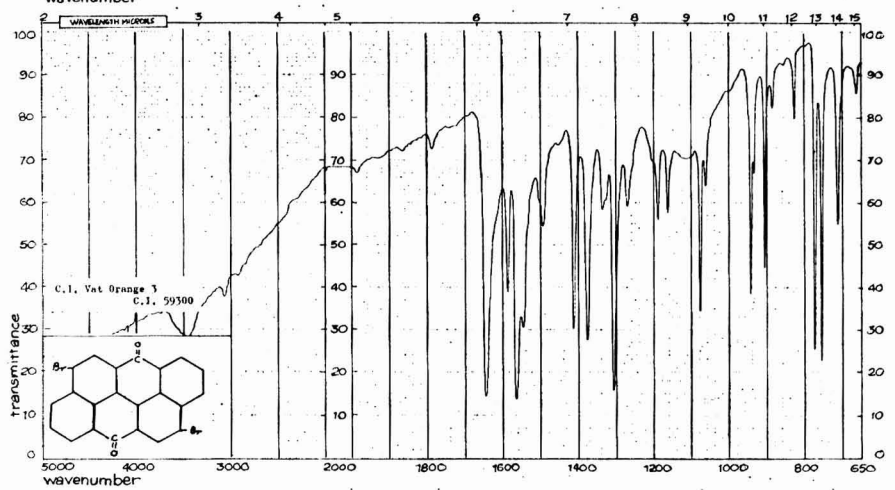
Vat Yellow 20
C.I. 68420
CONH
transmittance
wavenumber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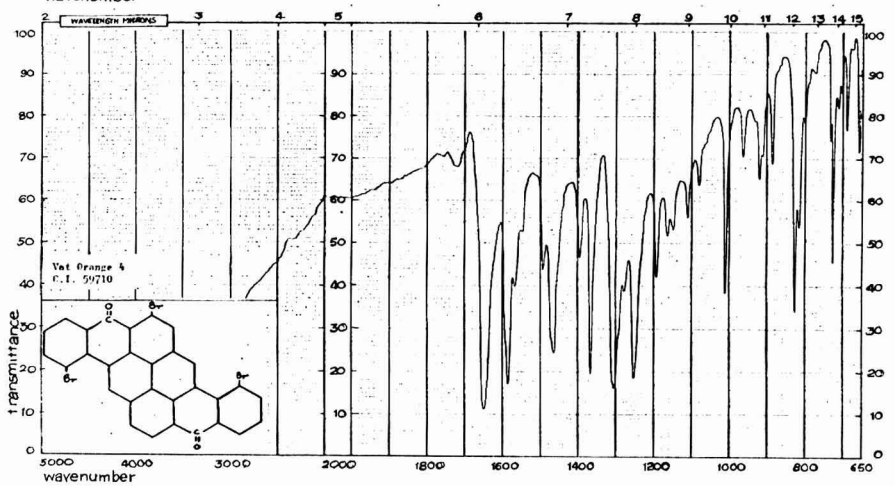
C.I. 59300
transmittance
wavenumber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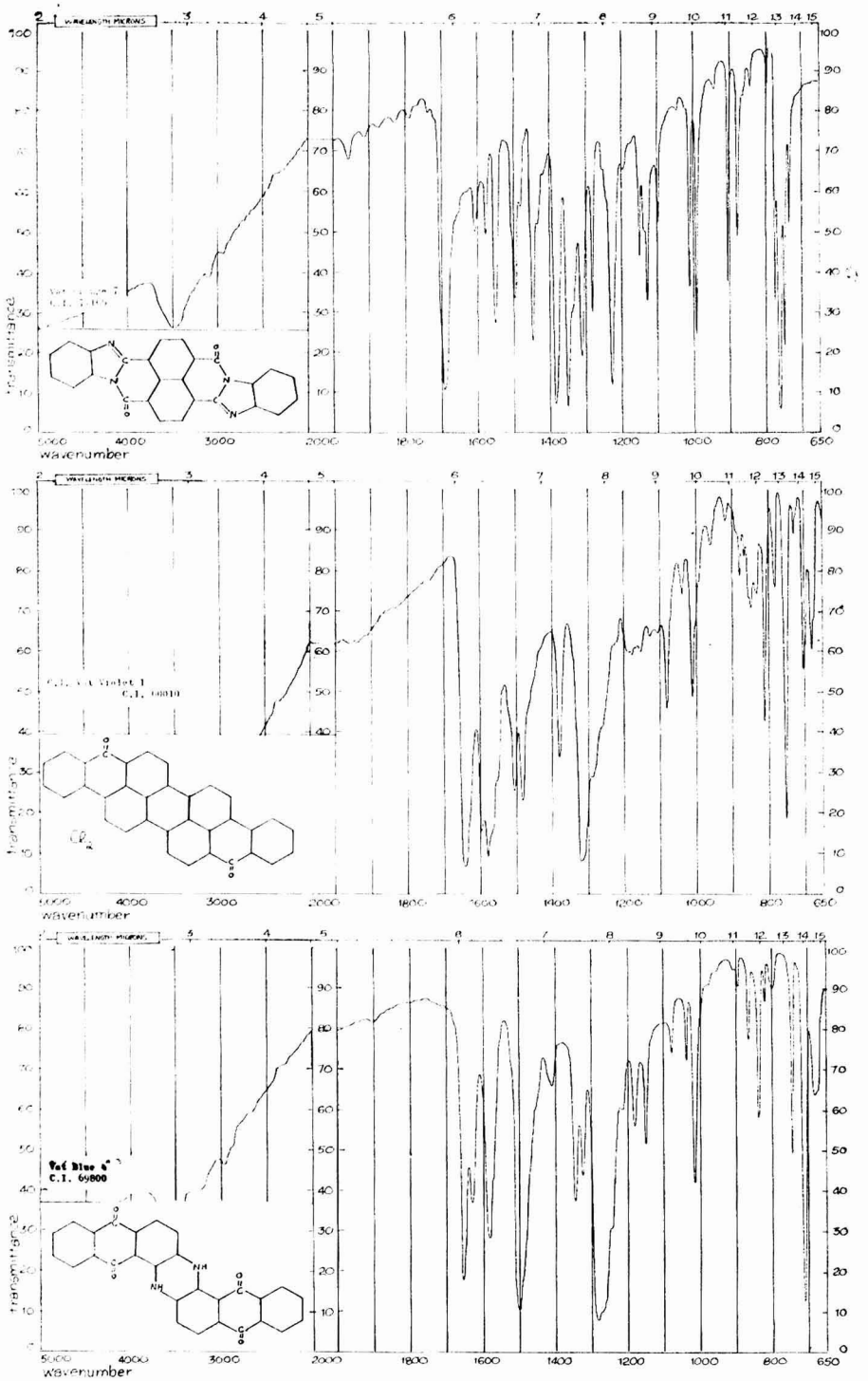
C.I. 59710
transmittance
wavenumber


wavelength microns
transmittance
wavenumber
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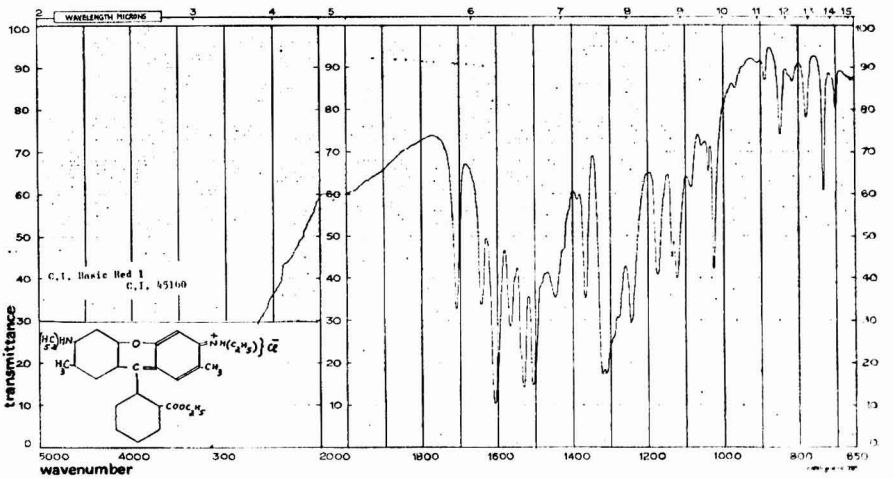
C.I. 60010
Cl2
Vat Blue 6
C.I. 69800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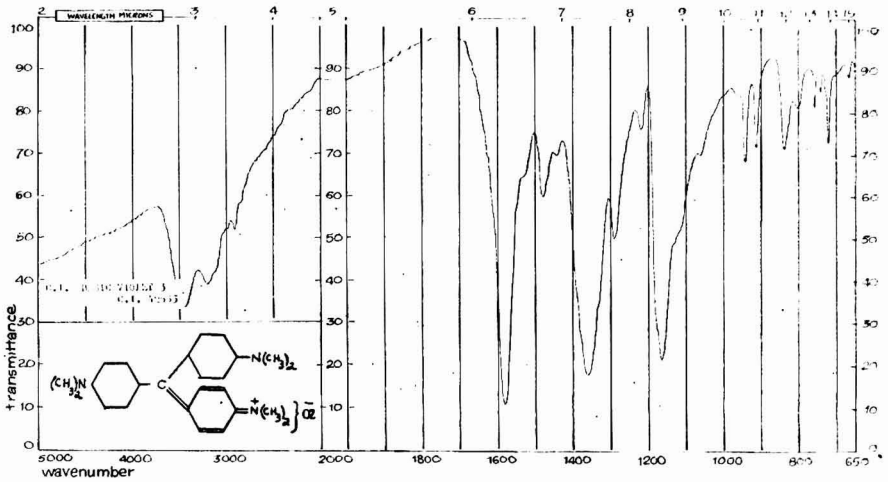
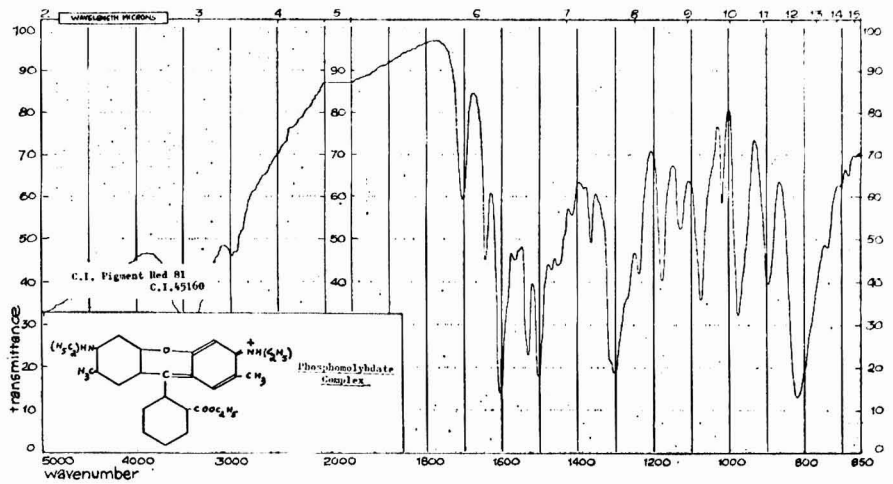
C.I. 45160
transmittance
wavenumber


WAVELENGTH MICRONS
transmittance
wavenumber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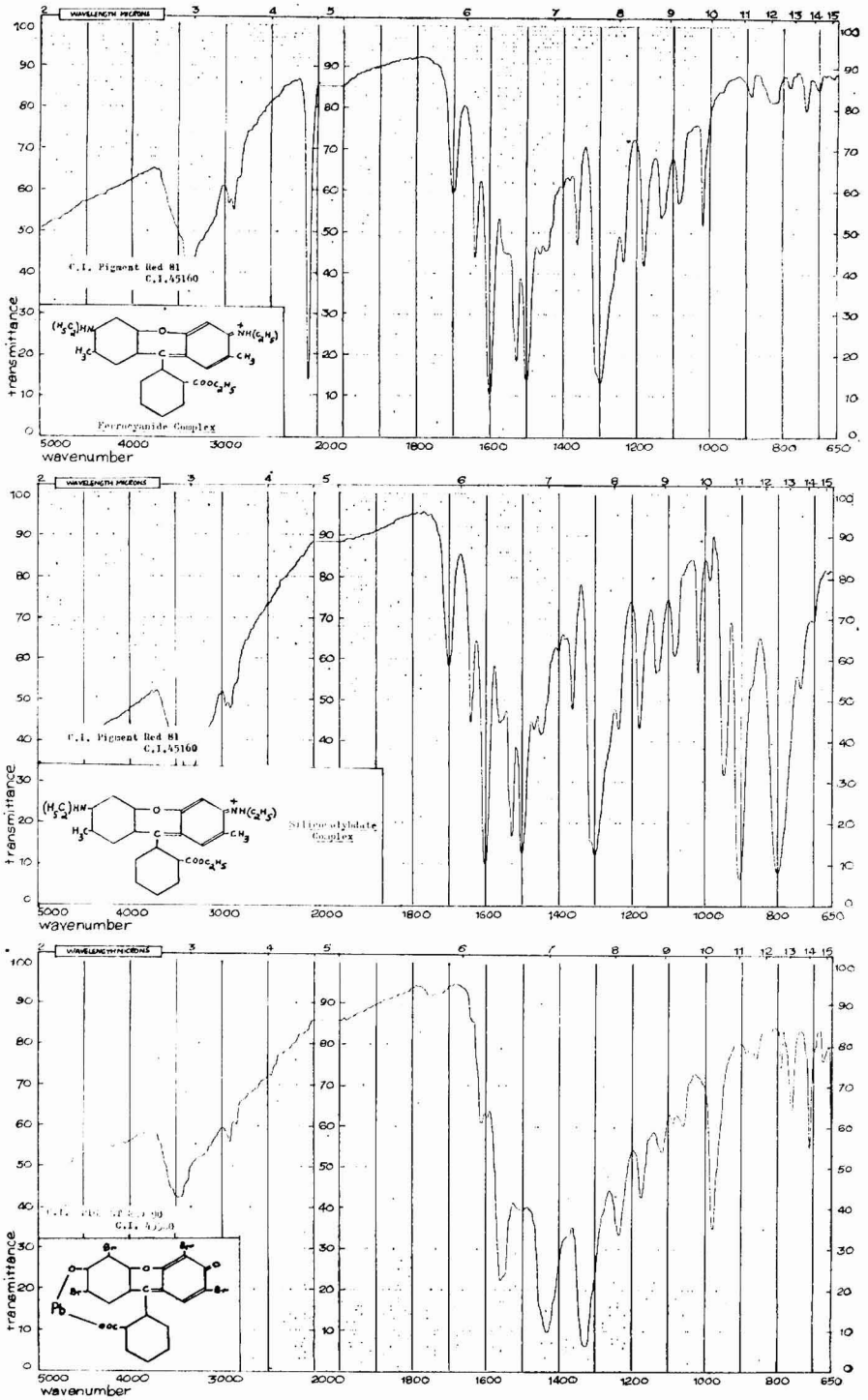
C.I. Pigment Red 81
C.I.45160
Phosphomolybdate Complex
transmittance
wavenumber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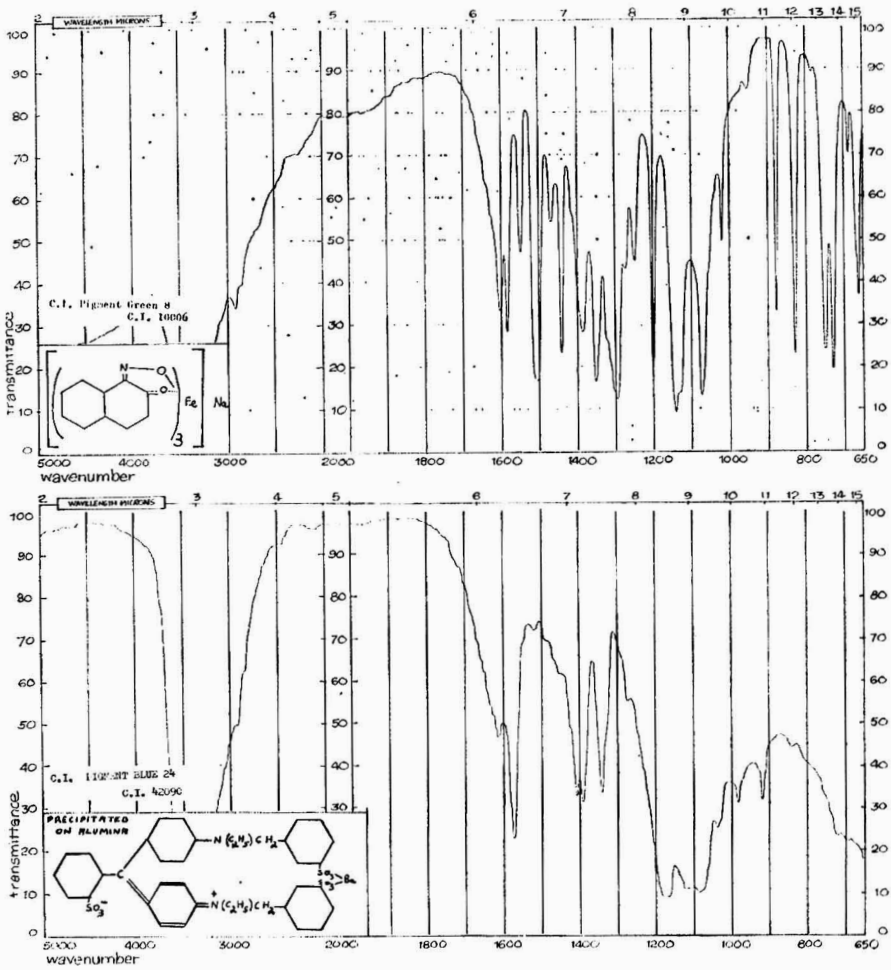
C.I. 45160
Ferrocyanide Complex
transmittance
wavenumber
C.I. Pigment Red 81
C.I. 45160
Silicomolybdate Complex
transmittance
wavenumber
transmittance
wavenumber



Conclusions

The methods described in this paper have been in routine use for several years and have proved reliable. They are essentially microchemical in scale and require sound technique to obtain the best results from them.

The library of infra-red spectra includes most of the commonly used pigments. The authors trust that it will prove useful to chemists who do not have access to a wide range of pigments.

Acknowledgments

We would like to thank Dr D. M. Stead for his encouragement and helpful criticisms, Mr J. Mackinlay for his advice and Harmon Colors for samples of many of the vat colours in our collection.

[*Received 19 February 1968*

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Next month's issue

The Honorary Editor has accepted the following papers for publication, and these are expected to appear in the August issue:

"Problems facing a designer when specifying surface coatings," *by D. Goodman.*

"User requirements in industrialised building," *by P. Whiteley.*

"Concrete as a substrate for paint," *by W. O. Nutt.*

"A paint manufacturer's view of industrialised building," *by T. Jones.*

"The problem of the factory and site application of decorative finishes for industrialised building," *by E. L. French.*

Guest Editorial

This issue contains a report of the Fiftieth Anniversary Celebrations held in London on 9 and 10 May and accordingly the Hon. Editor has invited the President of the Association (Mr F. Sowerbutts) to contribute this Guest Editorial.

It gives me very great pleasure to accept the Honorary Editor's invitation to contribute the Guest Editorial to this Jubilee Commemorative Issue of the Journal.

In the course of the two receptions at Wax Chandlers' Hall on 9 and 10 May which opened the Jubilee Celebrations, I was very proud to receive on behalf of the Association representatives from 24 kindred organisations and to accept from them their congratulatory messages. Many of these were in the form of beautifully illuminated addresses, to which the photographic reproductions appearing elsewhere in this issue do less than justice, but all the messages are being bound in one volume, so that Sections, if they so wish, may display them at suitable meetings or social functions.

Those Members who were fortunate enough to be able to participate in the Commemorative Service at St. Vedast found it a deeply moving experience. The address by the Rev. J. Robinson (Canon Residentiary at Canterbury Cathedral) was most appropriate to the occasion and thanks were given for all that had been accomplished since our foundation and for the selfless work of so many Members over the years. The service was enriched by a superb performance at the organ by our talented Past President, Dr J. E. Arnold, whose two recitals at the Past Presidents' Dinners during his term of office and at the Torquay Conference in 1965 are well remembered by those who were privileged to attend. An impressive rendering of the Anthem "Great Lord of Lords" (Charles Wood) was given by a choir of six, conducted by Dr Arnold, who was regrettably unable to be present at any of the other Jubilee celebrations owing to a most unfortunate accident sustained by Mrs Arnold some days earlier.

The Commemorative Lecture by Lord Todd on "Science and Society" was just as interesting and thought-provoking as one would expect from a scientist of such eminence, breadth of vision and wide experience, and we are most fortunate in retaining the continued interest of his Lordship, who was the principal guest and opener at our Technical Exhibition as far back as 1960.

At the Commemorative Dinner which followed, members of Council and others joined in a tribute to Founder Members, Past Presidents, Past Honorary Officers and Honorary Members, each of those present being invited to stand and then duly acclaimed. In his reply to my Address of Welcome to him and our other guests, it was most gratifying to hear Mr Edward Bush, the Master of the Worshipful Company of Painter-Stainers, pay tribute to the work of our own Director & Secretary, Mr R. H. Hamblin, and his staff on the excellence of the arrangements and the general organisation. On behalf of the Association I took that opportunity to endorse these remarks and I would now like to put on record our indebtedness to Mr Hamblin for the conception, organisation and execution of a most remarkable and successful programme. It is an undoubted fact that the more smoothly a function runs, the less do so many appreciate how much time, thought and attention have been devoted to its arrangement, but it is abundantly clear from comments made during the various proceedings that the amount of work involved on this occasion was well realised.

The Dinner at the Savoy Hotel emphasised once again the very great esteem in which the Association is held, both at home and abroad, and many of the Association's guests commented to me personally on how memorable they had found the celebrations and how effectively the Association plays its part in the industries it serves.

All Members will have received copies of the History of the Association and the Register of Members, and these, together with the Commemorative Booklet issued to all who attended the celebrations, show the substantial progress of the Association over the last 50 years.

As President, I was privileged in September last to represent the Association at the 5th Congress of the Federation of Scandinavian Paint and Varnish Technicians in Gothenburg and immediately after our Jubilee Celebrations I attended the 9th FATIPEC Congress in Brussels, where I was given the opportunity of thanking our hosts for their invitation, not only on behalf of OCCA, but also the Federation of Societies of Paint Technology and the Scandinavian Federation. In doing this, I stressed the importance of cementing still further the good international relations which already exist and pledged the closest collaboration of the OCCA secretariat in any move to organise a really big international convention, preferably in London.

Later this year, in a "Round the World" cruise which I am making with my wife, I intend to visit our Overseas Sections in South Africa and New Zealand as well as the Sections of the newly formed Oil and Colour Chemists' Association of Australia, and it was with considerable pleasure, therefore, that in our Jubilee Celebrations we were able to offer hospitality not only to Mr K. Christensen, the President of SLF who presented the Association with a magnificent specimen of Royal Copenhagen porcelain, and Mr R. W. Matlack, a Past President of the FSPT (representing their President), but also Mr A. R. Penfold, an Honorary Member not only of OCCA but also of OCCAA.

So much for the past. For the future, may I wish the very greatest possible success to the endeavours of all those holding office at all levels in the Association.

F.S.

Reviews

Formulation of Organic Coatings

By N. I. Gaynes with G. N. Danziger and F. C. Kinsler. London: D. van Nostrand Co. Ltd. Pp xii + 386 Price 107s 6d.

From the title of this book and the first chapter heading it might be supposed that it deals with formulation principles; this supposition would be wrong—it is a recipe book.

It is appreciated that the importance of and emphasis on different coatings will vary from country to country but it is hard to believe that nitrocellulose coatings for metal are five times as important for metal as acrylics, as judged by the length of treatment. This is typical of the imbalance of treatment that annoys the reader.

Some important and industrial systems receive scant, or no, mention. It is suggested by the authors that many large coating manufacturers develop their own specialist materials for these purposes and that these are not available to other formulators. Such a situation should not preclude discussion of the principles and requirements so that their relative importance is not misunderstood.

The writer could find no mention of polyester coatings or electrodeposition. Zinc-rich systems based upon chlorinated rubber get brief treatment but epoxy— or other based systems are not discussed. This is the result of formula selection rather than the provision of formulation principles with examples. We are told there are 224 formulae—this writer did not count them—and this would be splendid if they did not represent an unbalanced picture of surface coating needs.

Some of the logic is interesting too! One example will suffice. It says on p.17 the "Acrylic ester emulsions are the more expensive vehicle bases and consequently (*sic*) are more suitable for coatings designed for exterior exposure . . ."

The book has a passing interest for the European reader, mainly as a reflection of the different ways they do things "across the herring pond."

A. T. S. RUDRAM

Poisons and TSA Guide for Pharmacists in Retail and Hospital Practice

Published by direction of the Council of the Pharmaceutical Society of Great Britain. Compiled and edited by L. Priest. London : The Pharmaceutical Press, 1968. Ninth edition, pp. 282. Price (paper covers) 10s.

We tend to take a jaundiced view of apothecaries because of the name-stealing they have contrived, connived at, or condoned. If they ever had claim to be considered truly as chemists, they certainly have none now, when dispensing has become a matter of selecting the right package from the shelf. But whatever the apothecary has lost in chemical expertise is more than outweighed by his increased legal involvement.

Toxic materials tend to arouse strong public emotions, especially when administered with criminal intent, or when the symptoms of poisoning are pleasant; and much of the legislation has been enacted by Parliament in a mood

of near-hysteria, exaggerated by the fact that Members of both Houses are usually scientifically illiterate, and are backed by a scientifically illiterate Civil Service. It is the primary job of the apothecary to disentangle and administer the results.

He has to deal with poisons included in Part I or Part II of the Poisons List, which may or may not be included in the First or Fourth Schedules to the Poisons Rules, and with substances controlled under the Dangerous Drugs Act and under Part II of the Therapeutic Substances Act. Different regulations apply to the *sale* and to the *dispensing* of these substances, and there are substantial numbers of special provisions and exemptions, apart from the general exemptions of the Second and Third Schedules (the products of the industries covered by OCCA are exempted more or less *en bloc* in Group I of the Third Schedule). It must be noted that there is a multitude of different and complex requirements for storage, transport, packaging and labelling. Finally, we have such interesting questions as supplying drugs for use abroad, the control of poisons in hospitals, sale of animal medicines to farmers, animal feedingstuffs containing drugs and poisons, cruel poisons, disclosures under the Pharmacy and Medicines Act, 1941, and recommendations by the Pharmaceutical Society to its members.

This book is meant to guide the pharmacist through the jungle. So far as can be judged by a mere scientist, it does it extremely well.

M. H. M. ARNOLD

Student Review

Hon. Editor: It is intended to give greater prominence in future to Student Activities and the responsible officers are being asked to submit for publication notes on events and matters of particular interest to students arising in the Sections. These will form a new feature in the Journal and be associated from time to time with authorative review papers written with the particular needs of students in mind. The first of these papers appears below.

Coloured pigments in emulsion paints

By P. Birrell, BSc, FRIC

Geigy (UK) Limited, Paisley, Renfrewshire

It is the intention in this short review paper to discuss a few aspects of the pigmentation of emulsion paints with organic pigments. This will include physical form, choice of pigment, properties required and a few thoughts about the future.

Physical form

Organic pigments for emulsion paints are almost invariably used in the form of aqueous dispersed pastes, the dispersions being stabilised by anionic and/or non-ionic dispersing and wetting agents. The use of these aqueous pastes in emulsion paints has never been seriously challenged since their commercial introduction by pigment manufacturers in the early 1950s, rapidly following the commercial introduction of the early pva emulsion paints.

The important pigment paste properties are listed below:

high tinting strength
fine particle size
pourability (for ease of handling)
resistance to settling
resistance to drying on exposure to the atmosphere

All these properties can, of course, be controlled by manufacturing technique and formulation, but their relative importance can vary according to markets. For example, resistance to drying out can be of extreme importance in hot climates or in small manufacturing units, whereas in large units with rapid stock turnover these properties need only minor consideration.

Choice of pigment

The choice of organic pigment for use in emulsion paint, assuming good paste dispersion and emulsion compatibility, rests on the following rather obvious factors:

shade
intrinsic pigment strength
lightfastness

weathering fastness for outdoor application
fastness to weakly alkaline emulsions, surfactants and paint additives
fastness to substrates, particularly new plaster and asbestos compositions
economics

Other commonly considered pigment properties, such as heat resistance and solvent resistance, are of no importance for this application. Surprisingly, from the large numbers of organic pigments available the final selection for emulsion paints is limited to about 15 different chemical types, particularly when the last factor, economics, is considered. For example, all metal toners (calcium 4B, 2B toners, lithol reds) which are the basis for some cheaper decorative and industrial finishes and widely used in printing inks, are unsuitable due to extreme water sensitivity under slightly alkaline conditions.

The final choice for interior decorative emulsion paints and many exterior applications is limited to the following selection of pigments, most of which are offered in dispersed form by pigment manufacturers.

Arylamide Yellow 10G
Arylamide Yellow G
Dinitraniline Orange
Toluidine Red
BON Arylamide Bordeaux and Red
Phthalocyanine Blue
Phthalocyanine Green
Dioxazine Violets
Carbon Black

This list of pigments when completed by the inorganic red and yellow oxides can be used to obtain economically most required shades with satisfactory fastness properties.

Increasing interest in emulsion paints for exterior use, particularly outside the United Kingdom, is placing greater light and weather fastness demands on organic pigments, particularly for paler shades. The pigment selection given above must be increased to meet these demands in the yellow, orange and red colour range. Emulsion paint stainers are now available based on some of the newer and more expensive vat and polycyclic pigments.

This is not intended to be a complete survey of organic pigments. Such surveys have been carried out and offer excellent assessment of pigment chemistry in relation to emulsion paint and other applications.[1, 2, 3, 4].

Properties required

Assuming correct physical form and pigment selection the application properties of emulsion paint colorants depend entirely on formulation, surfactant selection, and manufacturing and grinding techniques. The function of wetting

and dispersing agents is to assist in the breaking of pigment aggregates and agglomerates during dispersion, to maintain stability after dispersion and to promote compatibility with polymer emulsions. Surfactants can be said to maintain stability of pigment dispersions by coating particles with an ionic or solvated sheath, promoting mutual repulsion resulting in stable dispersions. The surfactants used in pigment dispersions for emulsion paints are selected from the anionic and non-ionic classes. The subject of surfactant selection and quantity is covered more fully in a paper by C. Bondy, "The role of surfactants in emulsion polymerisation and emulsion paints"[5] and by P. Birrell "Modern aqueous organic pigment dispersions"[6].

Briefly, however, surfactant choice and quantity in pigment dispersions has a profound effect on several properties of pigment pastes and finished emulsion paints.

1. The dispersed paste should be easily mixed into emulsion paint at all concentrations and especially at concentrations higher than the normally expected maximum for full shade use without change in viscosity of the paint after pigmentation.
2. On storage of the paste or pigmented paint at 40°C for 1 month there should be no change in colour due to pigment crystallisation or flocculation.
3. There should be no tendency for the pigment to transfer from the aqueous to the resin phase. This tendency to "flush" can be assessed by subjecting the pigmented paint to conditions of high shear.
4. As with all paint systems there should be no tendency to pigment flocculation, i.e. the tendency of fine particles to associate into loose redispersible clumps.

It is beyond the scope of this short review to consider production methods and pigment dispersion techniques. This is very fully discussed in "Modern aqueous organic pigment dispersions" referred to above[6].

The future

It is difficult to imagine or predict any revolutionary changes in the pigmentation of emulsion paint. Pigment dispersions in use today, as has already been indicated, cover very adequately the large majority of requirements in the paint industry at very economic prices. Possibilities of change of emphasis of emulsion paint application to outdoor use resulting in increased colour fastness requirements have already been discussed. The changing emphasis has already led to emulsion compatible dispersions of more "exotic" pigments being made available, and no doubt this trend will continue, but it is not possible to imagine, for instance, the use of Arylamide Yellow 10G being replaced for interior decorative paints as its fastness properties are already more than adequate.

It is in the physical form of pigment dispersions that one can possibly see the next advances being made. The important properties of dispersion stability, resistance to drying and resistance to settling are obviously not ideally suited by water dispersed pastes. Great emphasis is being paid by the pigment industry to pigment dispersion and advances are now being made in the production of

dispersible or dispersed pigments in dry form. Water dispersible pigment powders for emulsion paints should obviously overcome drawbacks in drying and settling, two factors which limit formulation expertise for the pigment manufacturer. Water dispersible pigment powders have, of course, been available for some years but these have not been entirely suitable for emulsion paints due, in some cases, to compatibility difficulties and, in others, to effect on paint film performance, for example, high surfactant content leading to poor paint scrub fastness.

References

1. Smith, F. M. *JSDC*, 1962, **78**, 222-231.
2. Stead, D. M. *JOCCA*, 1960, **43**, 124.
3. Gaertner, H. *JOCCA*, 1963, **46**, 13.
4. Vesce, V. C. *Off. Dig.* 1959, **31**, No. 419 Part 2.
5. Bondy, C. *JOCCA*, 1966, **49**, 1045.
6. Birrell, P. *JOCCA*, 1964, **47**, 878.

Information Received

(In case of difficulty regarding addresses, members and subscribers to the JOURNAL should apply for details to the Director & Secretary of the Association at the address shown on the front cover.)

A new range of ethylene-vinyl acetate copolymer resins, claimed to be of a type not previously manufactured in Britain, has recently been introduced by **ICI Ltd.** The resins are of high vinyl acetate content, and have been designed to give adhesion, flexibility and toughness in hot-melt compositions. Five grades are now available; marketing will ultimately be under a new trade name.

Compounding Ingredients Limited have developed a new natural micronised amorphous silica, *Imsil A-10*, designed to provide the unique properties of amorphous silica in a micronised, easy-to-use form. Fine particle size—99.5 per cent below 10 microns—low surface area and low oil absorption are claimed, together with a refractive index of 1.54 and a GE brightness at 457 millimicrons of 88.5 per cent. Suggested applications are water-based automotive primers, where it improves chip resistance, as a loading material in silicone rubbers, and as an anti-slip agent in flooring compounds.

A new colorimeter which has the advantage that the sample does not have to be brought to the instrument has recently been announced by **The Tintometer Limited.** The *Lovibond Flexible Optic Tintometer* has a viewing head joined to the instrument by two leads of optical glass fibre, each about ¼in in diameter, and up to nine feet long. One carries controlled illumination to the sample, while the other carries the image from the viewing head back to the operator's eye. As the leads are flexible, items which previously were too heavy, bulky or inaccessible can now easily be studied. Specially developed heads are also available which will allow the study of specimens under a microscope, or liquids in a flowline. Scale readings are readily converted to CIE co-ordinates.

Mastermix Engineering Co. Ltd. has introduced a new mill specifically designed to increase productivity in the paint, ink, chemical and similar industries by offering a continuous mill in a wide range of sizes. Claimed to be the only machine of its type made in Britain, the *Mastermill* incorporates a water-jacketed grinding chamber enclosing a multi-disc agitator which keeps the grinding medium (ballotini) in constant circulation. The mill base is pumped through the chamber by a variable speed pump, the degree of fineness being governed by the throughput rate. The ground material is separated through a perforated screen, and can then be run or pumped off. The range of sizes available extends from laboratory scale, with a maximum output of three litres per hour, to a machine with a maximum output of 160 gallons per hour.

Two new technical data sheets have recently been published by **Spelthorne Metals Ltd.**

The first, *SL.20*, supersedes the earlier *SL.17* and *IS.100*, and gives details of a 15 months' exposure trial of water-based metallic primers.

The second, *SL.21*, supersedes *IS.99*, and describes the results of exposure trials comparing formulations of metallic lead primers based on 70-86 per cent oil length alkyd, 65 per cent oil length alkyd, simple and processed oils.

Copies are available from Spelthorne Metals Ltd.

A new range of epoxy resins, to be marketed under the trade name *Duroxyn W*, has recently been announced by **Hoechst Chemicals Limited.** The resins are based on Bisphenol A and Epichlorhydrin, and range from low molecular weight liquids to high molecular weight solids.

A new titanium dioxide plant with a capacity of 40,000 tons per annum is to be built by **Laporte Industries Limited** at their Stallingborough site. The new plant, which is to operate on a chloride process, will start production early in 1970.

A recent addition to the *Flammex* range of fire retardants produced by **Berk Limited** is *Flammex OA*. A bromine/phosphorus-based viscous odourless liquid with a light colour, *Flammex OA* is recommended for use in polyurethane foams, cellulose lacquers and varnishes, and other formulations requiring transparency.

A new guide to *DeVilbiss* spray painting equipment has recently been issued by **The DeVilbiss Company Ltd.**

British Titan Products Company Limited has published a new 46-page booklet (*BTP/146*) describing durability testing of *Tioxide* pigments, both at BTP weathering stations throughout the world, and by accelerated weathering techniques. Also from BTP is a new booklet describing the use of *Tioxide R-XL* in latex paints (*BTP/149*) and from **Titanium Intermediates Limited** a booklet (*TIL/7*) showing the use of organic titanium compounds as vehicles for heat-resistant paints.

A new company, **Industrial Waxes Limited,** has been formed to import, market and distribute mineral waxes, oxidised waxes and allied products, and to produce blends using manufacturing facilities in Manchester.

Agreement has been reached with **Fine Dyestuffs and Chemicals Limited** for Industrial Waxes to have exclusive selling rights for the *Rocsol* ranges of waxes and wax emulsions.

Bowmans Chemicals Limited have recently published a revised data sheet on available qualities of lactic acid and Transpar.

Scottish

Eastern Branch

Work study

The sixth ordinary meeting of the session, with Mr G. H. Hutchinson in the chair, was held in the Wee Windaes Restaurant on Wednesday 20 March 1968, when Professor Gloag, of the Heriot-Watt University, spoke on "Work study."

Professor Gloag introduced his talk by saying that work study was really specialised aspects of management. He then traced the history of the subject, which began with W. Taylor and "Scientific management." Taylor's method was demonstrated with reference to the job of foreman. How the job could be split into the broad divisions of planning and executive sections was described. This was expanded to show how these sections could be subdivided.

Professor Gloag illustrated the points he was making with many entertaining stories and anecdotes drawn from his vast experience. He concluded his talk by pointing out that nowadays work study experts had stopped breaking jobs down to a series of simpler operations, but were trying to build in an interest factor.

Then followed an extremely lively discussion period which was finally brought to a close, having occupied a longer time than the lecture, when the Chairman called on Mr R. Webster, a former pupil of Professor Gloag, to propose the vote of thanks.

J.H.S.

The display of illuminated addresses presented to the Association

In the week before the celebrations, all members were sent a copy of the History of the Association, compiled by Mr G. Copping (Hon. Member) in collaboration with Dr S. H. Bell (President 1965-67) and Dr H. A. Hampton (President 1961-63), together with a Register of Members, published for the first time.

Each person participating in any of the functions was given a copy of the 24-page Commemorative Booklet, and all visiting presidents and members of the Press received a copy of the History.

Thursday 9 May

The celebrations opened with a reception at 11.30 a.m. in the Court Room at Wax Chandlers' Hall, where the Association is privileged to have its offices. The President, Mr F. Sowerbutts, and Council welcomed Founder Members, Honorary Members, Past Presidents and Past Honorary Officers of the Association, as well as the presidents of other societies who brought their congratulations on 50 successful years of OCCA. A small exhibition of various aspects of the

Association, including the growth of membership, Sections and Branches, the circulation of the *Journal*, the Exhibition, the Paint Technology Manuals and other publications was on display, together with panels tracing the history of the paint industry, and others showing developments in methods of printing and inks in current use. Among the 80 people received were one Founder Member, three Honorary Members (of which two were also Past Honorary Officers and one a Past President), six other Past Presidents, eight Past Honorary Officers, and representatives of other societies as follows:

Mr J. N. T. Adcock, President, Institute of Metal Finishing.

Mr G. H. Beeby, Chairman, British Standards Institution.

Mr D. B. Collett, President, Institution of the Rubber Industry.

Sir Ernest Goodale, President, British Colour Council.

Dr S. T. Henderson, Chairman, Colour Group.

Mr N. Iliff, President, Society of Chemical Industry.

Mr R. W. Matlack, Executive Secretary and Past President, Federation of Societies for Paint Technology.

Mr A. R. Penfold, Honorary Member, Oil & Colour Chemists' Association Australia, representing OCCA Australia.

Mr L. W. Robson, President, Research Association of British Paint, Colour & Varnish Manufacturers.

Mr J. A. C. Talbot, Chairman of Council, Research Association for the Paper & Board, Printing and Packaging Industries.

Mr L. H. Williams, President, Royal Institute of Chemistry.

Seven illuminated addresses were presented, and many other messages of congratulation received and displayed.

After the reception, at 3.00 p.m., those members wishing to remain in the City until the Commemorative Service were taken on a tour of two nearby places of interest. The first, St. Lawrence Jewry, is a church originally built by Sir Christopher Wren, and subsequently rebuilt after war-time bomb damage. Of particular note were the beautiful ceiling, and a statue by Grinling Gibbons. The second, the Guildhall, dates back to 1174, at which time what is now the crypt was at ground level. The change in height is due in part to settlement of the building, which had no foundations as such, and in part to rise of nearby ground owing to the preparations of foundations for adjacent buildings. Members were also interested to see displayed the arms of the Worshipful Company of Wax Chandlers, and of the Worshipful Company of Painter-Stainers, whose hall the Association was privileged to use for the Lecture and Dinner that evening.

At 4.00 p.m. tea was served in Wax Chandlers' Hall, until 6.00 p.m., when members assembled at the parish church of St. Vedast-alias-Foster in Foster Lane for the Commemorative Service. This most impressive service was conducted by the Rev. Joseph Robinson, MTh, Canon Residentiary at Canterbury Cathedral. The President, Mr F. Sowerbutts, read the lesson, taken from Chapter Seven of the Book of Wisdom, verses 24-28.

During the service, the organ, which was built in 1731 by Renatus Harris, and was just such an organ as used by Bach and Handel, was played by Dr J. E. Arnold (President 1963-65). Dr Arnold is an organist at All Saints Church, Margaret Street, and had arranged for members of the choir of that church to be present and to render the anthem, "Great Lord of Lords" by Charles Wood.

After the service members proceeded by coach to the Painter-Stainers Hall for the Commemorative Foundation Lecture and Dinner. The President introduced the speaker, Lord Todd, FRS, who gave a lecture, entitled "Science and Society," to a crowded Court Room. It was felt that the quality of the paper was such that all members should have the opportunity to read it. Lord Todd has kindly given his permission, and it will be reproduced in full in a later edition of the *Journal*.

We've been doing our bit, too, as our Stand at the O.C.C.A. Exhibition revealed. Three ICI Divisions are bringing new techniques to the industries.

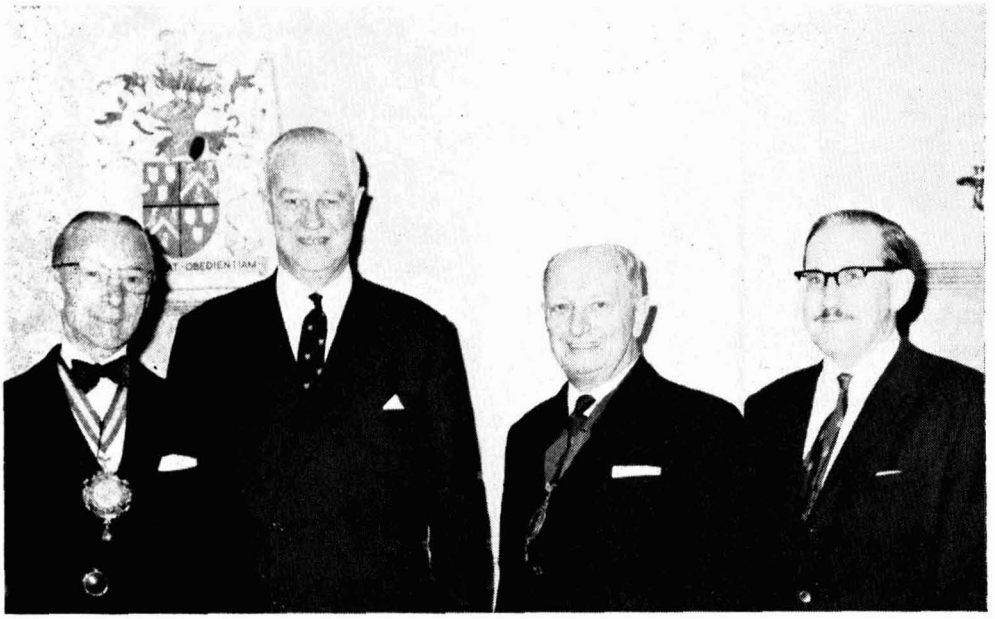
From Dyestuffs Division: further developments in the field of easily dispersed pigments for paint and printing inks and plastics; new developments in urethane coatings for chipboard, concrete and paper.

From Mond Division: advances in the technology of 'Alloprene' chlorinated rubber high-build coatings and their applications.

From Heavy Organic Chemicals Division: important new developments in vinyl acetate technology, including an improved method of testing the polymerisation activity of vinyl acetate monomer.

Imperial Chemical Industries Limited
Millbank, London S.W.1

ICI



Left to right: **Mr E. Bush (Master Painter-Stainers), Lord Todd, FRS, The President (Mr F. Sowerbutts), Mr R. H. Hamblin (Director & Secretary)**

After the lecture the company adjourned to the Dining Hall, where grace was said by the Venerable Samuel Woodhouse, Archdeacon of London. Following the meal the President proposed the loyal toast, and later gave the Address of Welcome. Mr Sowerbutts paid tribute, on this memorable occasion, to the Founder Members of the Association, who had brought the whole concept into being, and to the Honorary Members, Past Presidents and Past Honorary Officers, to whom the Association owed its strength and development over the 50 years of its being. In a moving ceremony he called upon each of the following members individually to stand and receive the acclamation of the company:

Founder Members: Mr R. P. L. Britton, Mr A. Z. Molteni.

Honorary Members: Mr G. Copping (also Past Hon. Editor), Mr G. N. Hill (also Past Hon. Editor), Mr A. R. Penfold.

Past Presidents: Mr W. E. Wornum, 1940-44 (also an Hon. Member), Dr H. W. Keenan 1944-47, Mr L. O. Kekwick 1951-53, Mr H. Gosling 1953-55, Mr C. W. A. Mundy 1955-57, Mr N. A. Bennett 1957-59, Mr P. J. Gay 1959-61, Dr S. H. Bell 1965-67.

Past Honorary Officers:

Hon. Secretaries: Mr S. G. Clifford 1924-29 (also Hon. Treasurer 1924-30), Mr R. S. Law 1947-54.

Hon. Editors: Mr T. Hedley Barry 1924, Mr A. A. Drummond 1929-31, Mr M. H. M. Arnold 1955-58, Mr I. C. R. Bews 1959-61, Mr D. S. Newton 1962-65.

Hon. Research and Development Officers: Dr J. O. Cutter 1941-43, Mr S. G. Tinsley 1945, Dr J. B. Harrison 1958-63.

Mr Sowerbutts also paid tribute to Mr R. H. Hamblin, Director & Secretary, for his work in organising the Celebrations and preparing the Commemorative Booklet.

The Master of the Painter-Stainers, Mr E. Bush, replied to the address of welcome, and in a witty and amusing speech congratulated the Association on its 50th birthday. The company dispersed at about 10.15 p.m., thus terminating the proceedings for that day.

Friday 10 May

Following a well attended Council meeting in the Haberdashers Hall, Staining Lane, at 9.30 a.m., the second day of celebrations opened with a Press reception in Wax Chandlers' Hall, at 12.00 p.m. The President and Council received 17 members of the Press as well as the presidents and representatives of other societies who had been unable to attend the previous day, and a total attendance of 50 was recorded. Visitors from other societies were as follows:

Mr G. F. Ashford, President, British Plastics Federation

Dr W. Blakey, President, Plastics Institute.

Mr B. Butler, President, Paintmakers Association.

Viscount Caldecote, President, Parliamentary & Scientific Committee.

Mr A. D. Ferns, President, Society of Dyers & Colourists.

Lord Kings Norton, representing the Royal Institution.

Mr J. Smethurst, Chairman, British Colour Makers Association.

Mr K. Christensen, President, Federation of Scandinavian Paint & Varnish Technologists.

Mr F. L. Waring, President, Chemical Industries Association.

Dr G. de Winter Anderson, Director, Paint Research Station.

Mr K. Flory, Director, Paintmakers Association.

Mr J. Ratcliffe, Secretary, Plastics Institute.

Dr D. C. Martin, Executive Secretary of the Royal Society.

Four further illuminated addresses were presented, and, although the presidents of the Royal Society and the Chemical Society were unable to attend, their addresses, individually bound, were received. The president of the SLF, Mr K. Christensen, presented a (ginger) jar of Royal Copenhagen porcelain. All these items were displayed, as shown in the photograph heading this report. It is felt that members will wish to read the magnificent illuminated addresses, and individual photographs of them are shown in this issue. It is intended to have the addresses bound in the form of a book, and it may be possible to make this available to the Sections to display on suitable occasions, if desired.

The Royal Copenhagen ware jar presented on behalf of the SLF

The members of the Press attending represented the following:

British Chemical Engineering.
British Ink Maker.
British Plastics.
Chemical Age.
Chemical Processing.
Chemistry and Industry.
Chemistry in Britain.
Corrosion Prevention & Control.
Daily Telegraph.
Financial Times
Industrial Finishing.

Journal of the Society of Dyers & Colourists.

Paint Manufacture

Paint, Oil & Colour Journal

Press Association

Rubber & Plastics Age

Surface Coatings

Thompson Newspapers.

Many favourable comments were heard on the setting and atmosphere provided by the Court Room, and by the trio who played in the minstrels' gallery throughout the proceedings.

In the evening 400 members and guests gathered at the Savoy Hotel for the 50th Anniversary Dinner Dance. The demand for tickets was so great on this occasion that many late applicants could not be accepted. The guests and their ladies were received by the President and Mrs Sowerbutts. The Association's guests were:

Sir Ernest Goodale, President, British Colour Council.

Mr J. Smethurst, Chairman, British Colour Makers Association.

Mr F. L. Waring, President, Chemical Industries Association.

Prof. Sir Ronald Nyholm, President, Chemical Society.

Dr S. T. Henderson, Chairman, Colour Group (Great Britain).

Mr K. Christensen, President, Federation of Scandinavian Paint & Varnish Technologists.

Mr R. W. Matlack, Executive Secretary and Past President, Federation of Societies for Paint Technology.

Mr J. N. T. Adcock, President, Institute of Metal Finishing.

Mr A. R. Penfold, Honorary Member, Oil and Colour Chemists' Association Australia.

Mr E. Bush, Master, Worshipful Company of Painter-Stainers.

Mr B. Butler, President, Paintmakers Association.

Dr W. Blakey, President, Plastics Institute.

Mr R. M. C. Nunneley, President, Society of British Printing Ink Manufacturers.

Mr A. D. Ferns, President, Society of Dyers & Colourists.

Mr C. B. Gregory, Master, Worshipful Company of Wax Chandlers.

After the meal the loyal toast was proposed by the President. The toast to the Association was proposed by Mr R. W. Matlack, on behalf of the Federation of Societies for Paint Technology, whose President, Mr H. L. Fenburr, was unfortunately unable to be present as he had suffered a slight stroke.

Mr Matlack began by tracing the history of the close liaison between the FSPT and OCCA, for which the credit was largely due to two people, Dr J. J. Mattiello of the FSPT, and Dr H. W. Keenan, a Past President of OCCA. The first suggestion of liaison had been contained in a letter from Dr Keenan which had been presented to the Federation in 1944 by Messrs K. G. Cooke and G. N. Hill (then Honorary Editor), who had gone to the USA representing the Birmingham Paint, Varnish & Lacquer Club. Final details were settled in 1946 when Dr Keenan went to the USA with Mr R. S. Law, then Honorary Secretary, and finally ratified at the Association AGM later that year.

Mr Matlack went on to cover the liaison that was now so well established, the exchange of lectures, the hospitality to visitors, the exchange of papers, and the exchange of journals. The *Journal* he felt, was now one of the best in the world in its field, as was their own *Journal of Paint Technology*. He commented on the success of the *Paint Technology Manuals*, and on the *Introduction to Paint Technology*, over 13,000 copies of which had been sold, and on the conferences and exhibitions, which were outstanding in the field of surface coatings.

In congratulating the Association on all its achievements Mr Matlack proposed

Left to right: **Dr S. H. Bell, Mrs Matlack, Mr R. W. Matlack, Mrs Penfold, Mr A. R. Penfold, Mrs Sowerbutts, The President, Mrs Butler, Mr K. Christensen, Mr B. Butler**

the toast to the Oil & Colour Chemists' Association, coupled with the name of the President, Mr F. Sowerbutts.

In his response Mr Sowerbutts thanked Mr Matlack not only for his speech, but for deputising for Mr Fenburr at short notice, and expressed the Association's delight at having Mr and Mrs Matlack present, as well as the other four members of their party (Mr & Mrs J. F. Rooney and Mr & Mrs L. P. Larson).

Mr Sowerbutts went on to welcome the ladies and guests; the Association was gratified that the representatives of so many other organisations were able to be present. He thanked the ladies for their forbearance. Although they knew the importance of colour in a drab world, the terminology of the industry must seem largely incomprehensible and they must wonder how their men could be interested in such a subject. This year marked not only the 50th Anniversary of OCCA. It was also the 50th Anniversary of the Suffragette movement, and everybody knew how much better things were now the ladies had the vote. He hoped that the gift each lady had received—a leather-bound notebook—would be of use.

He mentioned that, for the benefit of those present, the illuminated addresses and other messages received by the Association were on display in an adjoining room. In response to the Lord Mayor of London's challenge for the "War on Want," the Association had contributed an appropriate donation at both this function and the dinner on the previous evening and had received in return a plate inscribed for "The Absent Guest."

Finally he welcomed the Guest of Honour, the President of the Paintmakers Association, Mr B. Butler.

Mr Butler replied to the toast, saying how pleased he had been, on behalf of the Paintmakers Association, to congratulate the Association, and to present an illuminated address, at the reception earlier that day. The members of the Paintmakers Association owed a great deal to the work of the Association in keeping the United Kingdom paint industry foremost in technology.

THE ROYAL SOCIETY OF LONDON

TO THE

OIL AND COLOUR CHEMISTS' ASSOCIATION

THE ROYAL SOCIETY is pleased to convey its congratulations and best wishes to the Oil and Colour Chemists' Association on the occasion of its fiftieth Anniversary.

For half a century, the Association has played an important role in the encouragement and co-ordination of work in a wide and important field of technological research and production. The Royal Society recalls with pleasure that one of its Fellows served as President of the Association, and is glad to note also that the activities of the Association have stimulated the establishment of similar or related bodies in other parts of the world.

Noting the recent rapid chemical developments in this field the Royal Society hopes that the Oil and Colour Chemists' Association will further expand its activities, and increase the co-operation between scientists and technologists everywhere for the common good.

P M S Blackett

PRESIDENT

MAY 1968

To the President and Members of the

OIL AND COLOUR CHEMISTS' ASSOCIATION

FROM THE ROYAL INSTITUTION OF GREAT BRITAIN

ON the occasion of the Fiftieth Anniversary of the Founding of the Oil and Colour Chemists' Association, the President and Members of the Royal Institution of Great Britain extend their hearty congratulations.

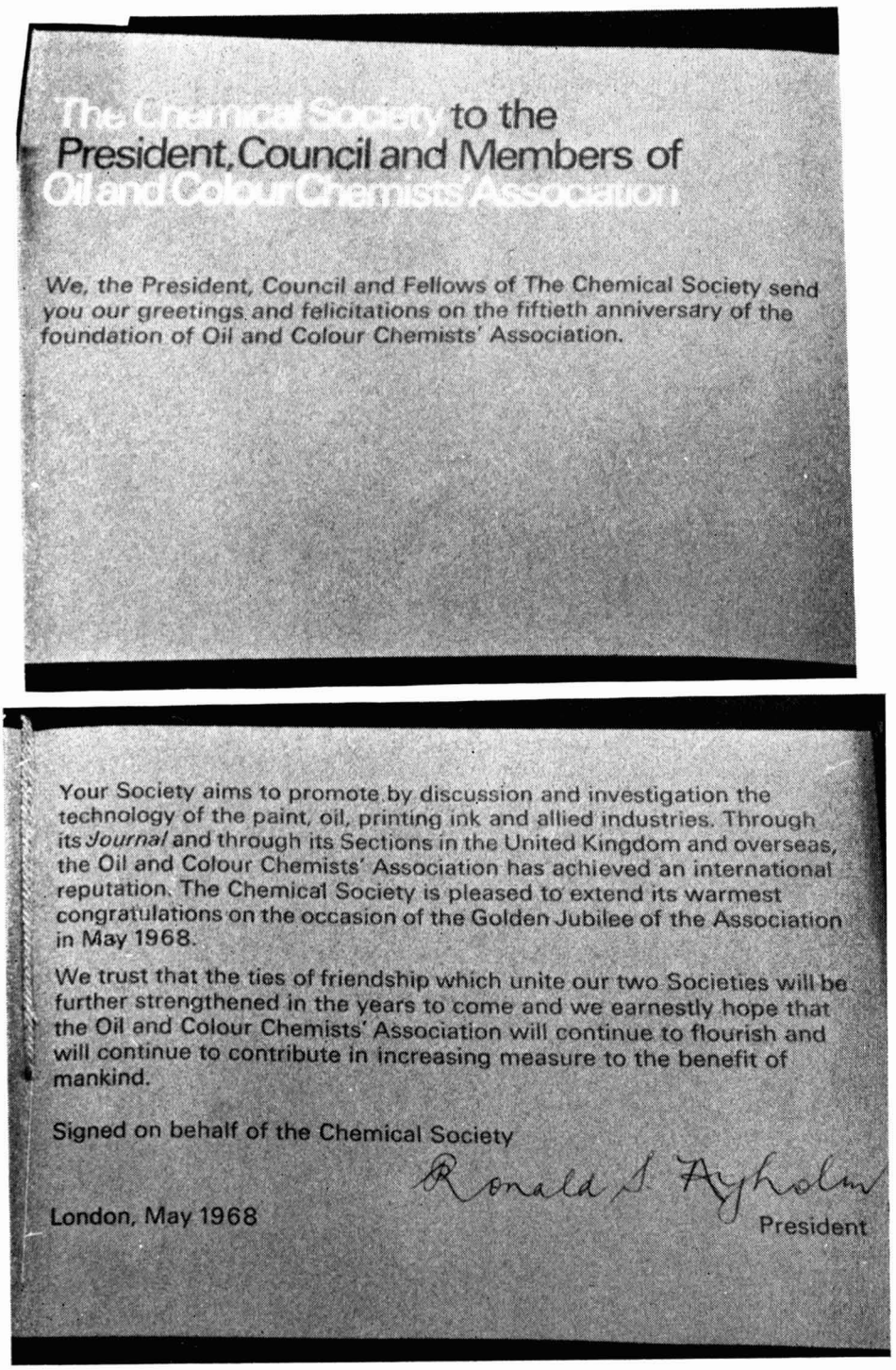
GLADLY accepting the invitation to attend the Jubilee Celebrations, the President and Members of the Royal Institution have appointed THE RIGHT HONOURABLE THE LORD KINGS NORTON OF WOTTON UNDERWOOD as their delegate, and have charged him to convey their felicitations.

GIVEN at the Royal Institution of Great Britain, in Albemarle Street, London W.1, on the tenth day of May, one thousand nine hundred and sixty-eight.

Fleck

Lord Fleck of Saltcoats, PRESIDENT.

A. G. Gaydon
R. Gresham Cooke
Hugh Elliott


The Chemical Society to the
President, Council and Members of
Oil and Colour Chemists' Association
We, the President, Council and Fellows of The Chemical Society send you our greetings and felicitations on the fiftieth anniversary of the foundation of Oil and Colour Chemists' Association.
Your Society aims to promote by discussion and investigation the technology of the paint, oil, printing ink and allied industries. Through its Journal and through its Sections in the United Kingdom and overseas, the Oil and Colour Chemists' Association has achieved an international reputation. The Chemical Society is pleased to extend its warmest congratulations on the occasion of the Golden Jubilee of the Association in May 1968.
We trust that the ties of friendship which unite our two Societies will be further strengthened in the years to come and we earnestly hope that the Oil and Colour Chemists' Association will continue to flourish and will continue to contribute in increasing measure to the benefit of mankind.
Signed on behalf of the Chemical Society
Ronald S. Nyholm
London, May 1968
President

The Society of Chemical Industry

salutes its sister body the

Oil and Colour Chemists' Association

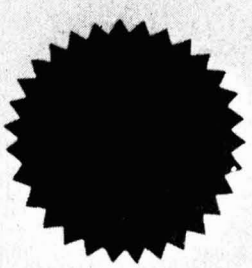
on the completion of half a century of endeavour in furthering the scientific development of the industry concerned with the manufacture of paint, ink, varnish and lacquers and the raw materials used in their production.

The Society recalls with satisfaction its close ties with the Association and in particular the contribution made annually to its "Reports on the Progress of Applied Chemistry," and also the fact that so many are members of both bodies.

The Society of Chemical Industry looks foward with confidence to the completion of the Association's Century and is sure that its contribution to a fuller and more colourful life will give satisfaction to the whole community.

President

General Secretary



TO THE
PRESIDENT, COUNCIL AND MEMBERS OF
THE OIL AND COLOUR CHEMISTS'
ASSOCIATION.

THE President, Council and Members of
THE SOCIETY OF DYERS AND COLOURISTS
offer their sincere congratulations on the occasion of the
FIFTIETH ANNIVERSARY OF THE FOUNDATION OF
THE OIL AND COLOUR CHEMISTS' ASSOCIATION

SINCE your foundation you have sought constantly to advance the technology of the industries concerned with paint, printing inks, pigments, varnishes, drying and essential oils, resins, lacquers, soaps, linoleum and treated fabrics.

THE high standing of your Journal and of the textbooks you have published is evidence of the success that you have attained, both nationally and internationally, in the pursuit of this objective.

AS the chartered body responsible for the promotion of the advancement of the science of colour, the Society welcomes the opportunity to honour a kindred body celebrating its

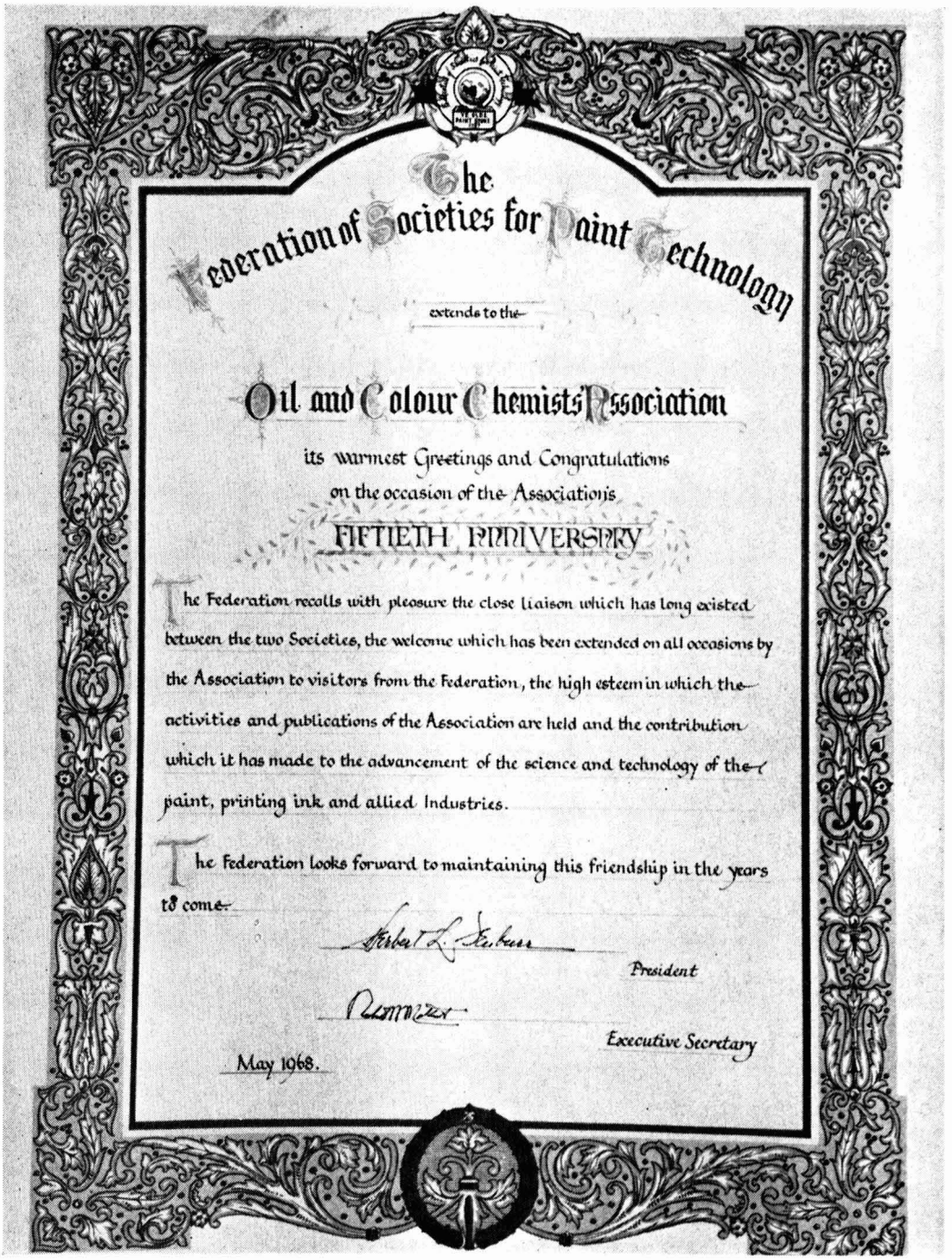
GOLDEN JUBILEE

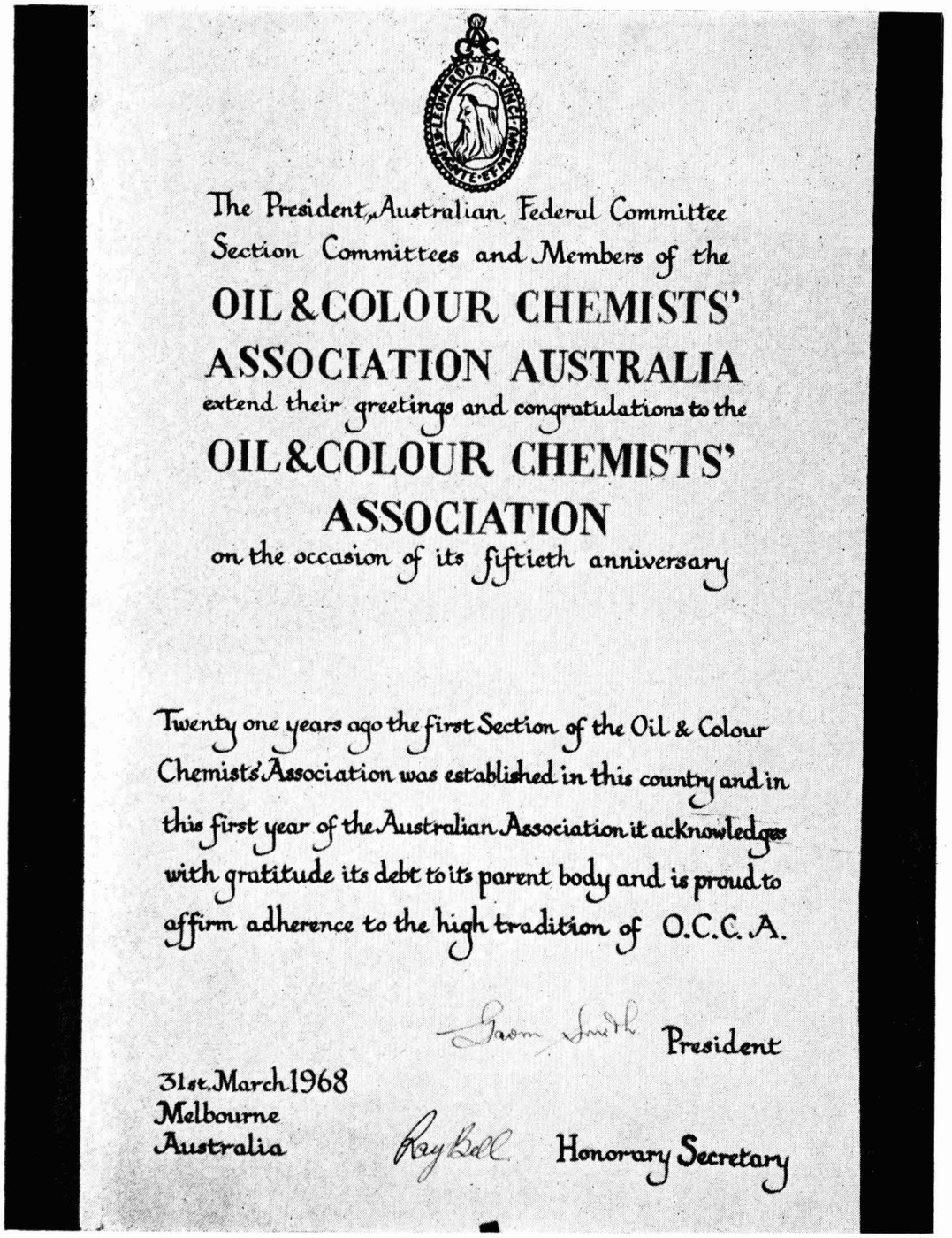
and to express the confident hope that the Associations next fifty years will be no less distinguished than its first.

A. T. Hems. President.

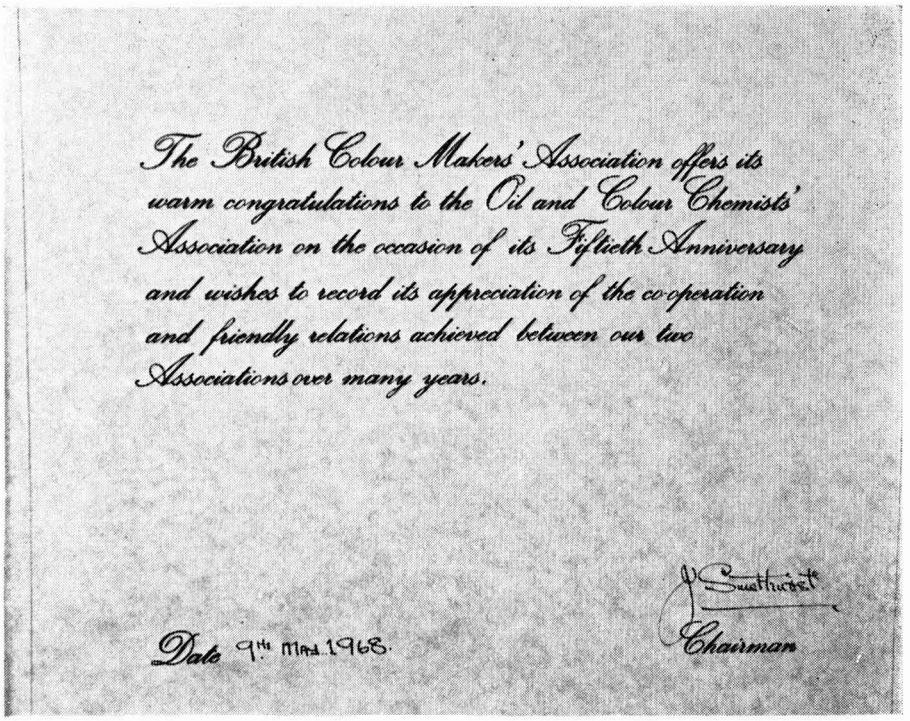
10th May 1968.

G. W. Cannell Honorary Secretary.


The Federation of Societies for Paint Technology
extends to the
Oil and Colour Chemists' Association
its warmest Greetings and Congratulations
on the occasion of the Association's
FIFTIETH ANNIVERSARY
The Federation recalls with pleasure the close liaison which has long existed between the two Societies, the welcome which has been extended on all occasions by the Association to visitors from the Federation, the high esteem in which the activities and publications of the Association are held and the contribution which it has made to the advancement of the science and technology of the paint, printing ink and allied industries.
The Federation looks forward to maintaining this friendship in the years to come.
Herbert L. Kirkham
President
Executive Secretary
May 1968.


The President, Australian Federal Committee
Section Committees and Members of the
OIL & COLOUR CHEMISTS'
ASSOCIATION AUSTRALIA
extend their greetings and congratulations to the
OIL & COLOUR CHEMISTS'
ASSOCIATION
on the occasion of its fiftieth anniversary
Twenty one years ago the first Section of the Oil & Colour Chemists' Association was established in this country and in this first year of the Australian Association it acknowledges with gratitude its debt to its parent body and is proud to affirm adherence to the high tradition of O.C.C.A.
President
31st. March 1968
Melbourne
Australia
Honorary Secretary


1918-1968
The Plastics Institute
sends Greetings and Congratulations to the
Oil and Colour Chemists' Association
on the occasion of the FIFTIETH ANNIVERSARY of its foundation.
The Institute has always had close ties with the Oil and Colour-Chemists' Association because both of the Industries which the two bodies serve have a common origin, that of the adaptation of polymers to particular requirements. No date can be ascribed to the beginning of your Industry in that prehistoric man used naturally occurring polymers and pigments to make surface coatings for decorative and protective applications. Through the ages your Industry has been in the forefront in the utilisation of new materials, especially synthetic polymers, in the practice of an art and craft that has contributed so much to the well-being of mankind.
Your annual exhibition is a noteworthy event and the standard achieved in this as in your other activities is greatly admired by your contemporaries.
With this appreciation of the service which your Association has rendered in the past are sent best wishes for your future.
Given under our hands and seal this ninth day of April 1968.
William Beale President
John Gadsby Chairman
Hon. General Secretary



The British Colour Makers' Association offers its warm congratulations to the Oil and Colour Chemists' Association on the occasion of its Fiftieth Anniversary and wishes to record its appreciation of the co-operation and friendly relations achieved between our two Associations over many years.

Date 9th May 1968.

Chairman

To The Oil And Colour Chemists' Association
On The Occasion Of Its
Fiftieth Anniversary

The transition of the chemist in industry from 'back-room boy' to modern technical executive and key member of any management team is a tribute to the dedication and enthusiasm of the founder members of the Oil and Colour Chemists' Association who formed this great organisation fifty years ago.

On behalf of the British Colour Council I offer sincere congratulations on what you have achieved for the benefit of us all and I bring best wishes for even greater achievements in the next fifty years.

9th May 1968.

President

Prudential House, Wellesley Road, Croydon, CR9 2ET. Tel. 01-686 3111/3.

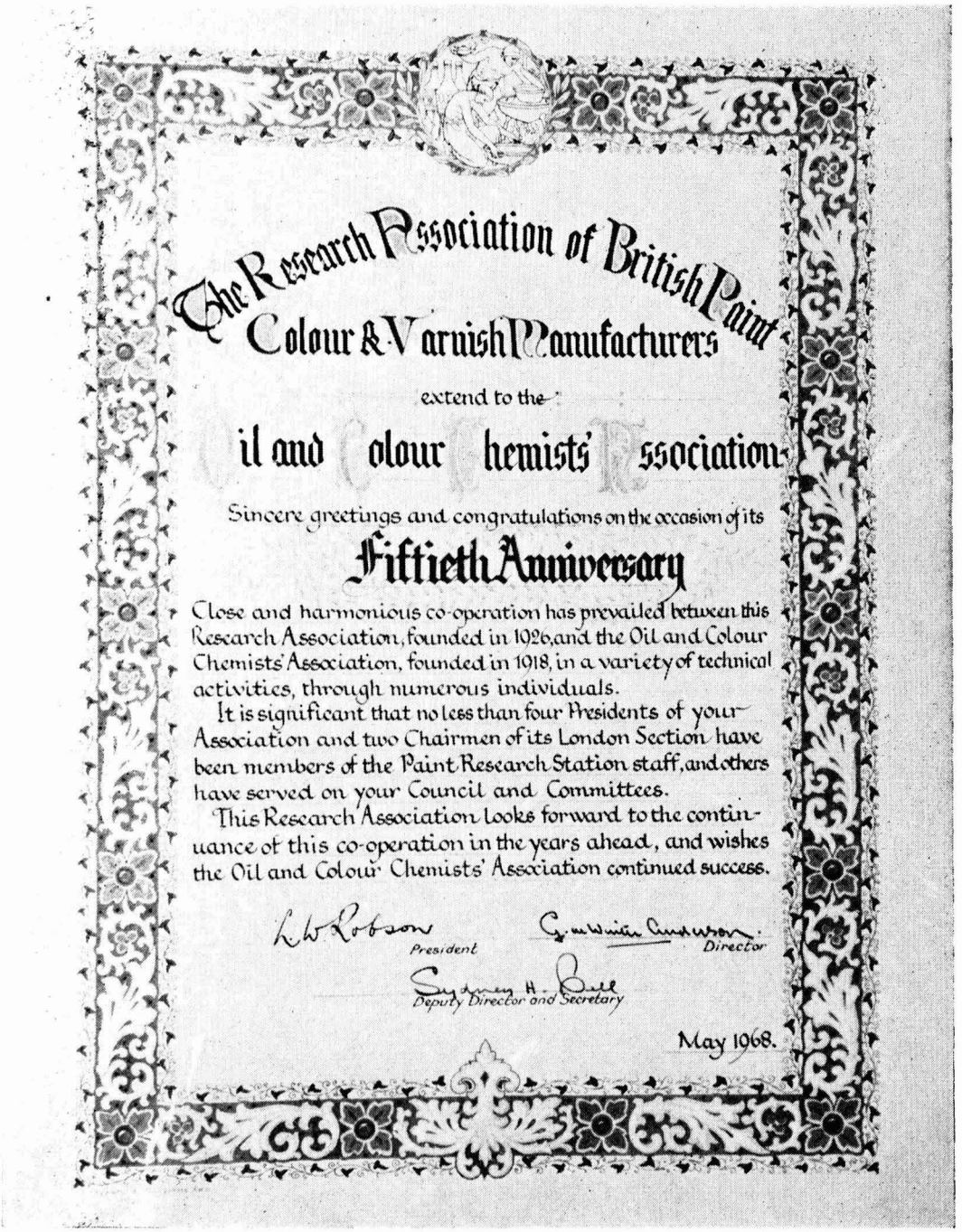
10th May 1968

We

The Paintmakers Association of Great Britain Ltd. wish to congratulate the Oil & Colour Chemists Association on its Fiftieth Anniversary & to extend the warmest possible greetings to all members. We are deeply conscious of the debt we owe to you all.
Your Annual Exhibition is attended by many representatives from overseas & is indicative of the high place you hold in international esteem.
May your Association continue to flourish & go from strength to strength.

Bernard Butler

B. BUTLER
President



The Research Association of British Paint Colour & Varnish Manufacturers

extend to the

Oil and Colour Chemists' Association

Sincere greetings and congratulations on the occasion of its

Fiftieth Anniversary

Close and harmonious co-operation has prevailed between this Research Association, founded in 1926, and the Oil and Colour Chemists' Association, founded in 1918, in a variety of technical activities, through numerous individuals.

It is significant that no less than four Presidents of your Association and two Chairmen of its London Section have been members of the Paint Research Station staff, and others have served on your Council and Committees.

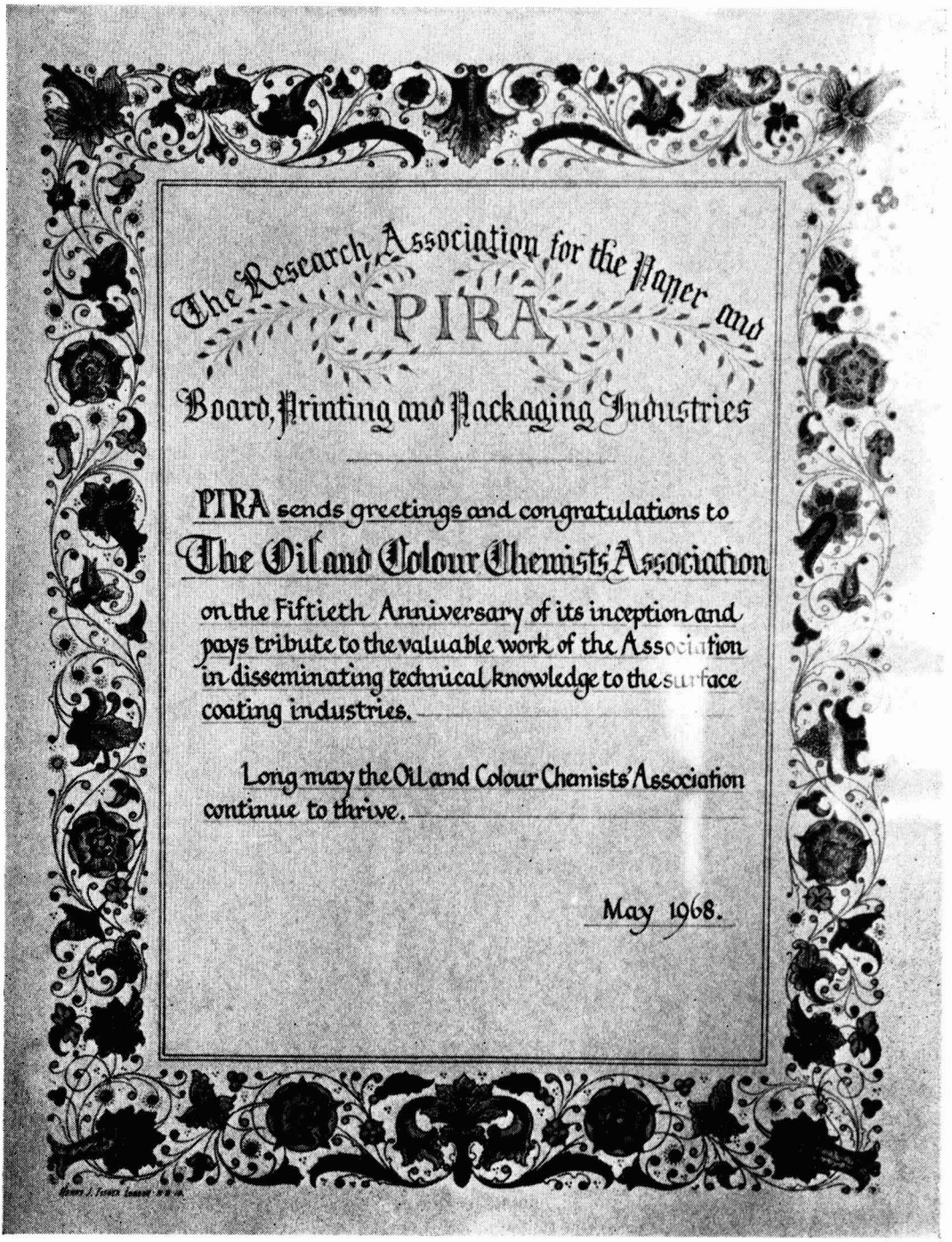
This Research Association looks forward to the continuance of this co-operation in the years ahead, and wishes the Oil and Colour Chemists' Association continued success.

L. W. Robson
President

G. W. Winter Anderson
Director

Sydney H. Bull
Deputy Director and Secretary

May 1968.


The Research Association for the Paper and
PIRA
Board, Printing and Packaging Industries
PIRA sends greetings and congratulations to
The Oil and Colour Chemists' Association
on the Fiftieth Anniversary of its inception and pays tribute to the valuable work of the Association in disseminating technical knowledge to the surface coating industries.
Long may the Oil and Colour Chemists' Association continue to thrive.
May 1968.

Mr Butler thanked the hosts, on behalf of the ladies and guests, and congratulated them on the organisation which had made the 50th Anniversary so memorable.

Dancing followed the speeches, interspersed by entertainment provided by the well-known illusionist, Robert Harbin, and Rex Grey's Cabaret. At 1.00 a.m. the music of the Jerome Orchestra ended, and the Toastmaster, Mr E. Orchard, who had officiated throughout the two days of the celebrations, brought to a close the final event in the Jubilee Celebrations.

The two days of celebrations had been well attended, and, judging by the comments of the participants, were most successful.

A few copies of the 24-page booklet printed for the celebrations are still available, and these will be supplied to any members who make written application, while stocks last.

R.W.

Midlands Section

Annual General Meeting

The 20th Annual General Meeting of the Midlands Section was held on 26 April at the Winston Restaurant, Edgbaston, Birmingham. After the report and statement of accounts of the Section and of Trent Valley Branch had been received and approved, the committee's nominations for Officers were accepted. The retiring Chairman, Mr C. H. Morris, then handed over the meeting to the new Chairman, his brother, Mr D. J. Morris, who refuted suggestions of nepotism and said that he would try to maintain the high standards set by his brother. A ballot was then held to fill two vacancies on committee.

The Officers and Committee for the coming year are:

Chairman: Mr D. J. Morris.

Immediate Past Chairman: Mr C. H. Morris.

Hon. Secretary and Representative on Council: Mr D. J. Silsby.

Hon. Treasurer: Mr H. J. Griffiths.

Hon. Publication Secretary: Mr L. R. Seaborne.

Hon. Social Secretary: Mr A. S. Gay.

Committee: Messrs. A. E. Claxton, P. C. Daley, R. F. Hill, D. E. Hopper, T. D. Nation and D. Penrice.

Hon. Auditors: Mr H. J. Clarke and Mr F. Cooper.

After the meeting members sat down to a supper of faggots and peas or tripe and onions. Entertainment was then provided by a comedian, a pianist and a singer.

West Riding Section

Annual General Meeting

At the Sixteenth Annual General Meeting of the West Riding Section, held at the Griffin Hotel, Leeds, on Tuesday 9 April 1968, at 7.30 p.m., all the Office-Bearers were re-elected for the ensuing year, and Messrs. H. L. Drew and E. Smith were appointed to replace Messrs. D. H. DuRieu and M. Cochrane who retired from the committee.

Following the official business of the evening, the Chairman, Mr L. H. Silver, and members were joined by their ladies to enjoy a pleasant social evening over a buffet supper.

TECHNICAL EXHIBITION

21-OCCA (the Association's Twenty-first Technical Exhibition) will be held at Alexandra Palace, London on the following dates and times:

Monday 24 March	3.00 p.m.-6.30 p.m.
Tuesday 25 March	10.00 a.m.-6.00 p.m.
Wednesday 26 March	10.00 a.m.-6.00 p.m.
Thursday 27 March	10.00 a.m.-6.00 p.m.
Friday 28 March	10.00 a.m.-4.00 p.m.

The Invitation to Exhibit was despatched to companies both in the United Kingdom and overseas at the end of May and many completed application forms have already been returned. Any company intending to exhibit in 1969 must return a completed application form to the Association's offices by **3 September 1968.**

Copies of the *Official Guide* to the Exhibition will be sent individually to chemists and technologists in the paint and allied industries in Western Europe, to consuming firms in this country and to all members of the Association wherever resident. Copies can also be obtained free of charge from the Association's offices; admission to the Exhibition is free.

Each copy of the *Official Guide* will contain a form of application for tickets for the Exhibition Luncheon, which will be held at the Savoy Hotel, London WC2 on Monday 24 March 1969.

Also being prepared for distribution on the Continent is a leaflet in English, French, German, Italian, Russian and Spanish, containing a map and directions on how to reach the Exhibition.

Any companies wishing to apply for stand space at 21-OCCA who have not previously exhibited should write to the Director & Secretary at the address given on the front cover of the *Journal.* The exhibition is believed to be unique in that it is entirely technical, and is aimed at ensuring that technical advances are passed on as quickly as possible to the technical personnel in the paint, printing ink and allied industries. The technical advances may relate to new products, new knowledge of existing products and their uses, or in suitable cases existing knowledge which has not been available to the consuming industries.

In order to show the high regard in which the Exhibition is held, some extracts from the reports of 20-OCCA in other journals are given below:

"Many of the exhibits did, however, represent developments of, improvements in, or additions to, existing ranges which, in all fairness, is perhaps only to be expected in an industry which is nowadays

highly developed scientifically and technologically.

What was significant was the continuation of the trend noted at last year's exhibition—the considerable number of exhibits relating to the testing of raw materials and finished products. There was also a substantial contribution from the machinery and plant manufacturers with a marked proportion of equipment from overseas."

—*Paint, Oil & Colour Journal*

"To sum up, this was a colourful exhibition with a well-balanced representation of equipments and materials (resins, pigments, solvents etc.), and with a multiplicity of new developments which should have satisfied the most critical technical visitor. OCCA can well be proud of their achievements."

—*Chemistry & Industry*

"Opened by the Rt. Hon. Lord Erroll of Hale, the exhibition covered a wide variety of products, processes and technology, many of which were new."

—*Surface Coatings*

". . . it is generally difficult or, indeed impossible, to discern any definite trends from one year to the next, but a comparison of the exhibits over a more prolonged period provides, within limits, a reasonably reliable indication of the direction technical development is taking in the industry."

—*Paint Manufacture*

Meeting of Council

The meeting of Council on Friday 10 May, held during the Fiftieth Anniversary Celebrations, was attended by 28 members under the chairmanship of the President, Mr F. Sowerbutts, at the Haberdashers' Hall, Staining Lane, London EC2.

It was announced that the President Designate, appointed by the Council for the next session, would be Mr A. S. Fraser, Past Chairman of the Scottish Section, who would then relinquish his post as the Association's Hon. Treasurer. Subject to confirmation at the Annual General Meeting in Bristol on 28 June it was agreed by Council to nominate Mr A. W. Blenkinsop, Past Chairman of the Newcastle Section, as the Association's Hon. Treasurer in succession to Mr Fraser.

The first report from the Working Party on Education, Training and Qualifications, under the chairmanship of Dr S. H. Bell, would be ready by the July Council Meeting and it was reported that discussions had been held with other societies engaged in education and training and much information had been collected.

Council received the recommendation of the President's Advisory Committee on the question of an Hon. Public Relations Officer which had been referred to it after the first report of the Working Party on "Forward Thinking." It was decided that public relations amongst the Sections could, for the present, be carried out by the Hon. Secretary of the Association at meetings of Hon. Secretaries of Sections and Branches, and that these meetings might be held more frequently than previously. If desirable the procedure could be reviewed at a later date.

Council was disturbed to learn that it was not possible to finalise the Association's accounts for 1967 owing to the fact that the returns from the Australian Federal Committee had not been received, though these had been promised by the end of April. It was expected that they would be received shortly, but in the meantime, in accordance with the Articles, voting papers for the Elective Members of Council would be sent almost immediately to members, together with such other items for the Annual General Meeting as were available. The Finance

Committee's Report and the Accounts would be sent to members at a later date before the Annual General Meeting.

The Hon. Treasurer reported that preliminary arrangements for the 1969 Exhibition had been agreed at a meeting of the Exhibition Committee on 8 May and invitations to exhibit, etc., would be despatched by the end of May. The Exhibition will be held at Alexandra Palace from 24-28 March inclusive, 1969.

The Hon. Research and Development Officer reported that a number of papers had been received for the Association's Conference to be held at Eastbourne in 1969 on the subject of "Film formation and curing." He reported also that at the moment he was negotiating for papers from Scandinavia and America.

The South African Section will be holding a Symposium in September and Council was asked to inform that Section of the names of any members likely to be in South Africa during that month who could present a paper, preferably on acrylics. Any member who might wish to present a paper to the South African Section Symposium is asked to write to the Director & Secretary immediately.

As already mentioned in the *Journal*, the Association is one of the bodies participating in the Joint Conference which will be held in London on 29 and 30 September and 1 October 1970 under the auspices of the SCI, PI, IRI, SDC and OCCA under the provisional title "Advances in the chemistry of liquid and thermo-plastic co-polymers." As before, members of the Association wishing to attend the Conference will enjoy a preferential rate and further information will be published in the *Journal*.

The British Standards Institution had asked the Association to appoint a representative to serve on Panel OC/20/4/12—Chemistry and Chemical Technology (UDC 54+66). Mr K. R. W. Chitty was invited to represent the Association and intimated his willingness to do so.

Under the item "Section Reports" (which appears on each Council agenda), Council agreed in principle to a suggestion made by the London Section Chairman that the European Liaison Lecture might be held one evening during the week of the Association's Annual Technical Exhibition at Alexandra Palace to provide an opportunity for members who do not live in the London area to attend the Lecture. If this proposition proves practicable further information will be published in the *Journal*.

News of Members

Dr J. C. Hudson, an Ordinary Member attached to the London Section, has been made a Membre d'Honneur of l'Association Belge pour l'Etude, l'Essai et l'Emploi des Matériaux, in recognition of his services in promoting collaboration between British and Belgian researches on corrosion and protection.

Federation of Societies for Paint Technology

Mr W. W. Vasterling has been nominated as President-Elect of the Federation of Societies for Paint Technology for 1968-69. Mr Vasterling was previously Treasurer of the Federation.

Unit 8 in the "Federation series on coatings technology," published by the FSPT, has recently become available. Entitled "Inorganic color pigments" the booklet is by W. R. Fuller and C. H. Love, runs to 44 pages, and costs 50c per copy.

Corrosion Symposium

The Yorkshire Branch of the Institution of Corrosion Technology is to run a one-day Symposium on "Design of protective systems for structural steelwork" at Leeds University, commencing at 9.00 a.m. on 19 September 1968.

IARIGAI Conference

The International Association of Research Institutes for the Graphic Arts Industry (IARIGAI) have announced the subject for the 10th International Printing Technology Conference. This is to be "Recent developments in graphic arts research," and the conference will be held from 1-17 June 1969 in Semmering, Austria.

European Technological Forecasting Association

An organisation has recently been set up with the stated aim of encouraging the exchange of views of persons interested in Technological Forecasting, and to advance techniques in this field. Technological Forecasting is defined as the foreseeing of what kinds of technological advances are possible in the light of social and industrial trends, and to channel the lines of development in directions best suited to these.

Further details are available from the chairman of the UK branch: Mr P. D. Wilmot, c/o CIBA (ARL) Limited, Duxford, Cambridge.

Register of Members 1968

The following members should be added to the Register of Members circulated to all members in May:

MILNER, PETER JAMES, 10 York Road, Acton, London W3. L/O. 1966.

SAXBY, MICHAEL FRANK, MA, BSc, ICI Ltd., Paints Division, Wexham Road, Slough, Bucks. L/O 1965.

THOMS, HUGH SYDNEY, W. W. Hill Son & Wallace Ltd., Elton Street, Broughton Bridge, Salford 7, Lancs. M/O. 1946.

WALLACE, DEREK MICHAEL, 521 Hylton Road, Pennywell, Sunderland, Co. Durham. N/J 1966, O.1967.

The following are corrected entries:

ADDENBROOKE, BRIAN JOHN, BSc, "Avalon," 14 Blakesley Road, Yardley, Birmingham, 25. Mid/J. 1956, O.1960.

ADHYA, SUDHIR KUMAR, 107 Endlesham Road, London SW12. L/A. 1962, O. 1966.

ALLSOP, CYRIL, DFM, 148 Hookstone Drive, Harrogate, Yorks. WR/O. 1953.

ARNOLD, MICHAEL HENRY MILLER, BA, BSc, LLB, FRIC, AMIChemE, Ivy Cottage, Moore, Via Warrington. L/O. 1948.

ARONSON, PETER DAMIEN, BSc, British Titan Products Co. Ltd., Central Laboratories, Portrack Road, Stockton-on-Tees, Teeside. N/O. 1966.

ASHBY, EDWARD PETER, British Titan Products Co. Ltd., 416 Royal Exchange, Manchester 2. M/A. 1963.

BEDFORD, MICHAEL JOHN, 76 Reynolds Close, Carshalton, Surrey. L/O. 1966.

BITHELL, RAYMOND, BSc, FRIC, 18A Carlton Terrace, Low Fell, Gateshead 9, Co. Durham. N/O. 1946.

BUBLICK, EUGENE PETER, LRIC, 31 Broadlands Court, Bracknell, Berks. T/O. 1959.

CARTER, ALBERT HAROLD, BSc, PhD, ARIC, 17 The Poynings, Richings Park, Iver, Bucks. L/O. 1956.

CHRISTIE, PETER DONN, Guthrie & Wells Ltd., 580 Lawmoor Street, Glasgow C5. S/O. 1958.

COHEN, JACOB DAVIS, BSc, ARIC, 103 Francklyn Gardens, Edgware, Middlesex. L/O. 1938.

DARKE, RICHARD MICHAEL, LRIC, 39 Victoria Street, Barbourne, Worcester. Mid/A. 1964.

DAVIES, FRANK WATKIN, LRIC, 15 Kibworth Close, Whitefield, Lancs. L/A. 1956, O. 1960.

DEACON, DAVID HUMFREY, "Lavandou," Copthall Lane, Chalfont-St.-Peter, Bucks. T/O. 1961.

EADES, ALAN GORDON, API, The Laboratories, BIP Chemicals Ltd., PO Box No. 18, Tat Bank Road, Oldbury, Warley, Worcs. Mid/O. 1965.

EDWARDS, JOHN KENNETH PARKES, TD, MA, FBICSc, 23 Cresttor Road, Woolton, Liverpool 25. M/O. 1961.

ELLINGER, MISS MARIANNE LIVIA, PhD, ARIC, 9 Queen's Gate Terrace, London SW7. L/O. 1957.

GAY, PHILIP JAMES, BSc, Hangers Paints Ltd., The Storry Smithson Group, Bankside, Hull, Yorks. H/O. 1939.

GERRARD, ALAN, 42 Laburnum Park, Bradshaw, Bolton. M/O. 1958.

GRAY, ALAN, BSc, 27 Thornly Park Drive, Paisley, Renfrewshire. S/O. 1967.

GREENFIELD, ERIC, 28 Keats Drive, Coseley, Staffs. Mid/O. 1963.

GREY, JOHN BUCKINGHAM, BSc, FRIC, Pinchin Johnson & Associates, Kingston Group Laboratories, 380 Richmond Road, Kingston-on-Thames, Surrey. L/O. 1939.

GRIMSHAW, FRANCIS PETER, MSc, FRIC, API, 30 Ridgeway, Epsom, Surrey. L/O. 1955.

HALL, ALBERT GEORGE, 11 Willow Court, Carr Lane, Willerby, Hull, Yorkshire. H/O. 1964.

HARVEY, LESLIE C. W., TD, 352 Albert Drive, Glasgow S1. S/O. 1937.

HEBBLETHWAITE, H. H., Charles A. Stead & Co., Barclays Bank Chambers, Bridge Street, Stockport, Cheshire. M/A. 1936.

HOLDSWORTH, ERIC WALTER, BP Chemicals (UK) Ltd., Plastics Department, Devonshire House, Piccadilly, London W1. T/A. 1961.

HOLT, ALFRED GORDON, BSc, BPharm, PhC, "Morantine," 16 Westfield Road, Maidenhead, Berks. T/O. 1948.

HUDSON, J. C., DSc, DIC, ARCS, FIM, Espero, 15 Uplands, Ashtead, Surrey. L/O. 1942.

HUTTON, DAVID JOHNSTON, DSc, Westfield, Chapel Road, Alderley Edge, Cheshire. M/A.

KELLY, ERIC JAMES KELLAS, MSc, ABCO Petroleum Ltd., Gants Hill, Ilford, Essex. L/O. 1944.

LANGDON, MICHAEL GEORGE, LRIC, 36 Whitecroft Road, Bolton, Lancs. M/O. 1965.

LEACH, DAVID JOHN, BSc, "Hill Cottage," 241 Chipstead Way, Woodmansterne, Banstead, Surrey. L/O. 1958.

LEIGH-BRAMWELL, PHILIP, W. & J. Leigh & Co., Tower Works, Kestor Street, Bolton, Lancs. M/O. 1944.

LILLY, EUGENE LAWRENCE, BSc, ARIC, Armstrong Cork & Co. Ltd., Kingsbury, London, NW9. L/O. 1951.

MCFARLANE, DONALD, BSc, ARIC, "Grassholm," 20 Landor Avenue, Killay, Swansea, Glam. B/O. 1964.

MAY, VICTOR CHARLES, ARIC, 21 Sheringham Drive, Barking, Essex. L/O. 1961.

MUNN, PETER WILLIAM, BSc, 58 Swyncombe Avenue, London W5. L/O. 1962.

MYNETT, RAYMOND JOHN, Columbian International (GB) Ltd., Four Ashes, Wolverhampton, Staffs. Mid/O. 1965.

NEASMITH, DEREK EDWARD THOMAS, LRIC, 41 Park Road, Leyland, Lancs. M/O. 1967.

NICHOLLS, ROGER FREDERICK, 39 Petherton Road, Hengrove, Bristol 4. B/J. 1962 A. 1967.

NIELSEN, HANS KRISTIAN RAASCHOU, Danish Paint & Ink Research Laboratory, 14 Odensegade, Copenhagen, Denmark. O/O.1947.

PACE, GRAHAM, BSc, Woodland Cottage, Finchfield Hill, Finchfield, Wolverhampton, Staffs. Mid/J.1956, O.1961.

PATRICK, ALAN CLIVE, DipChemTech, "Mizen," Woodvale Road, Upper Beaumont Drive, Cork. I/O.1965.

POUGHER, HENRY LANDIS, 8 Jervis Road, Bilton Grange, Hull. H/O.1948.

ROBINSON, T. W., 9 Grenville Way, Whitley Bay, Northumberland. N/O.1947.

ROTHWELL, GERALD WILLIAM, BSc, ARIC, Ministry of Public Building & Works, Building Research Station, Garston, Watford, Herts. L/O.1965.

ROUT, PETER GEORGE, ARIC, AMIOP, Universal Printing Ink Co. Ltd., Maxwell Street, Morley, Nr. Leeds. WR/O.1950.

ROWNTREE, RANDAL PETER, 155 Sale Lane, Tyldesley, Nr. Manchester. M/O.1964.

RUSHTON, FRANK MICHAEL, AMCST, 36 Harpers Lane, Bolton, Lancs. M/O.1961.

SAFE, KENNETH ALFRED, 4 Copley Way, Tadworth, Surrey. L/O.1946.

SANDERS, JOHN DONALD, BSc, PhD, ARIC, Geigy (UK) Limited, Pigments Division, Hawkhead Road, Paisley, Renfrewshire. S/O. 1959

SHIELDS, BRYAN DOUGLAS CLIVE, BA, Shell Chemicals UK Ltd., Villiers House, 41-47 Strand, London WC2. L/O. 1961.

SMITH, HENRY BARCLAY, BSc, c/o Vinyl Products Ltd., 159 Deanston Drive, Glasgow, S1. S/O.1965.

STAR, DOUGLAS ERIC, BSc, LRIC, 47 Hillside, Banstead, Surrey. L/O.1942.

SYKES, ROGER CHRISTOPHER, API, Ciba Clayton Ltd., Queen Street, Leicester. Mid/O. 1966.

TRICKETT, DAVID GRAHAM, Columbian International (GB) Ltd., Four Ashes, Wolverhampton, Staffs. Mid/A.1958.

VAN ZUYLEN, JAN WYBREN, Bosboom Toussaintplein 276, Delft, Holland. O/O.1965.

WAGLAND, ROBERT ERNEST, BSc, ARIC, 17 Falconers Park, Sawbridgeworth, Herts. L/O.1951.

WALL, RONALD JAMES, 18 Queens Gardens, Codsall, Wolverhampton. Mid/A.1957.

WATSON, PETER EWART, MA, FInstP, The Outer Lodge, Beech Hill Park, Near Waltham Abbey, Essex. L/O.1956.

WESTBROOK, ERNEST LOUIS EDWARD, AIOB, MRSH, FCS, "Trees," 8 Wharf Road, Wroughton, Swindon, Wilts. L/O.1948.

WHITAKER, ALFRED HAROLD, "Fiesta," 30 Sea Avenue, Rustington, W. Sussex. L/O., Hon.1956.

WILLIAMS, NORMAN, 104 Southport Road, Lydiate, Lancs. M/A.1953.

The following are corrected entries for the Appendix of Junior Members:

MASON, JOHN OLIVER, 39 Aberdare Gardens, Hampstead, London NW6. L/J.1966.

SPURLING, STANLEY JOHN, 52 Whinfell Way, Riverview Park, Gravesend, Kent. L/J.1964.

Oil and Colour Chemists' Association

President : F. SOWERBUTTS, B.SC.TECH.

The Oil and Colour Chemists' Association was formed in 1918, to cover paint, printing inks, pigments, varnishes, drying and essential oils, resins, lacquers, soaps, linoleum and treated fabrics, and the plant, apparatus and raw materials useful in their manufacture. In 1923 it absorbed the Paint and Varnish Society. The stated purpose of the Association is to promote by discussion and scientific investigation the technology of the industries concerned with the above-mentioned products, and to afford members opportunity for the interchange of ideas. This is achieved by the regular holding of ordinary meetings at which papers are presented, and the organisation of annual technical exhibitions, biennial conferences, educational activities and practical co-operative experimental work. Details of these activities are given in the *Journal of the Oil and Colour Chemists' Association*, which is published monthly, and whose pages are open to receive communications and other pronouncements on scientific and technical matters affecting the members of the Association and the industries concerned. The Association's meetings also afford opportunities for members to meet informally and socially.

There are Sections of OCCA in Auckland, Bristol, Hull, Ireland, London, Manchester, the Midlands (with a Trent Valley Branch), Newcastle upon Tyne, Scotland (with an Eastern Branch), South Africa (with Branches in the Cape, Transvaal and Natal), Thames Valley, Wellington, and the West Riding, and these are responsible for the conduct of their own local affairs. There is also a General Overseas Section. There is also a close alliance between the Association, the Federation of Societies for Paint Technology in the United States, and the Fédération d'Associations des Techniciens de l'Industrie des Peintures, Vernis, Emaux et Encres d'Imprimerie de l'Europe Continentale (FATIPEC). The Association also maintains cordial relations with the Scandinavian Federation of Paint and Varnish Technicians (SLF).

Ordinary Membership is granted to scientifically trained persons, and Associate Membership to others interested in the industries covered. Junior Membership, which is intended primarily for students, is open without restriction to persons under the age of 21 and to those up to 25 who are following a course of technical study. The annual subscription in each case is five guineas, except for Junior Members whose subscription is one guinea. An entrance fee of 10s. is payable by all members. Applications for membership are invited from suitably qualified persons who are engaged or otherwise interested in the industries noted above. Applications, which should be supported by two members of the Association (one of whom must be an Ordinary Member), should be forwarded to the Director & Secretary at the address given below. Application forms and full details of membership may be obtained from the offices of the Association.

Publications

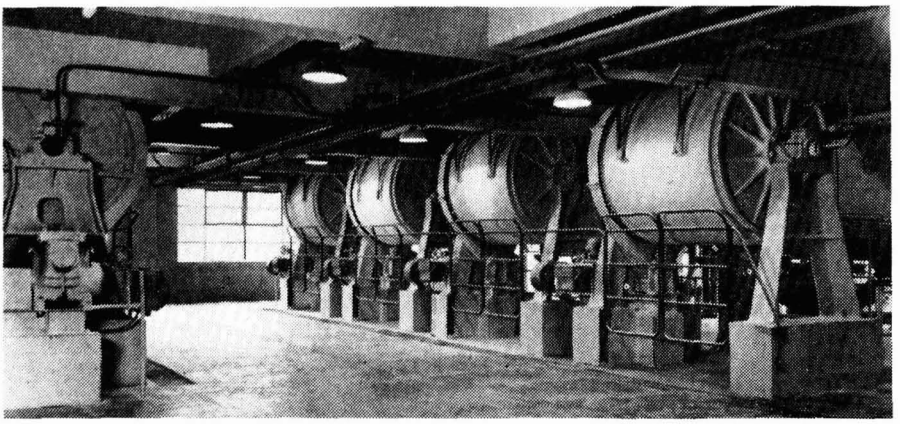
Journal of the Oil and Colour Chemists' Association. Published monthly. Subscription rate to non-members in UK and abroad, £7 10s. p.a. post free ; payable in advance.

An Introduction to Paint Technology (Second Edition with additional chapter). Pp. 187, illustrated, with index, £1 (including postage).

Paint Technology Manuals

Part 1 : " Non-convertible Coatings "
Part 2 : " Solvents, Oils, Resins and Driers" } Second editions this year.
Part 3 : " Convertible Coatings," Pp. 318, 35s.
Part 4 : " The Application of Surface Coatings," Pp. 345, 35s.
Part 5 : " The Testing of Paints," Pp. 196, 35s.
Part 6 : " Pigments, Dyestuffs and Lakes," Pp. 340, 35s.

Director & Secretary : R. H. Hamblin, M.A., F.C.I.S., F.C.C.S., Wax Chandlers' Hall, Gresham Street, London, E.C.2.



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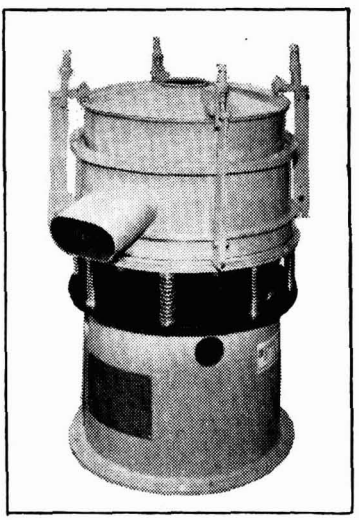

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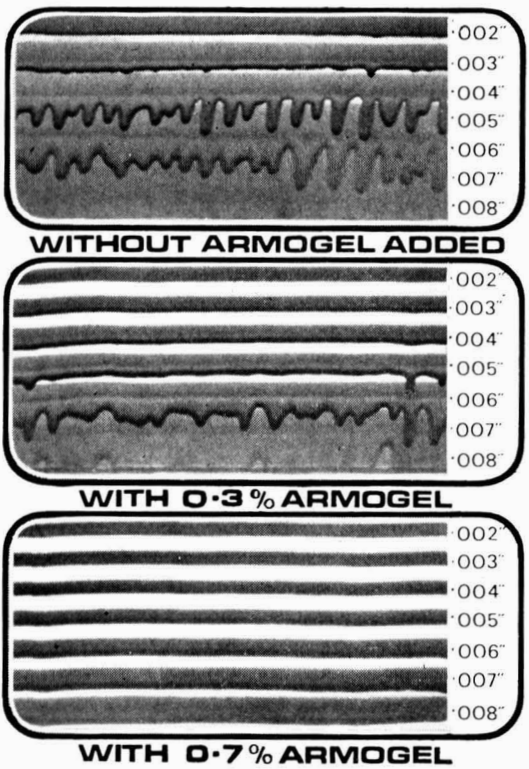

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