BOOK REVIEWS

N. G. GAYLORD, Editor

Technology of Non-metallic Coatings. A. Y. DRINBERG, E. S. GUREVICH, and A. V. TIKHOMIROV (translated by E. BISHOP). Pergamon Press, New York–Oxford–London–Paris, 1960. xvi + 531 p.p. $15.00.

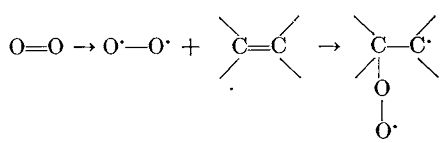
It is incredible that a book so pregnant with misconceptions, so naïve yet so archaic, could have been published in 1960. Only extensive quotation could make a review believable:

Page XIV: "The human eye can distinguish about 150 different colour shades." [Actually, the number is well over 1,000,000.] "The most important components of such equipment [instruments, machine tools and machinery] are painted in colours which attract the worker's attention and make it easier to find them."

Page 2: "Types of corrosion damage: 1 uniform, 2 non-uniform, 3 patchy, 4 pitting, 5 pinpoint, 6 intercrystalline, 7 sub-surface."

Page 3: "Polar or ionic bonds, also known as valency bonds, are formed between oppositely charged ions."

Page 60: "The Bach-Engler autoxidation theory (*Berichte*, **30,** 1669 (1897)) is the most probable. It is based on the idea that the oxygen molecule is an unsaturated compound which is consequently capable of combining with an oxidizable substance, without prior dissociation into atoms. . . . ."



Page 75: "Macromolecules in which the carbon chain has no mobile substitutes [*sic*], such as polyethene, have the highest stability."

Page 76: "In hetero-chain polymers, the polarity of the molecules is connected with the molecular weight value. The higher the molecular weight, the smaller is the polarity of the molecules . . ."

Page 88: "The oxidation breakdown of saturated carbon-chain polymers, e.g. polystyrene, only proceeds at significant rates at high temperatures. At ordinary temperatures, oxidation breakdown in these polymers takes place vanishingly slowly, since the phenyl group is oxidation-resistant."

Page 95: "The products of extensive breakdown are normally crystalline: their accumulation in the film increases its brittleness."

Page 145: "Since the majority of coatings fail as a result of water penetrating through the paint film, the water resistance of the film is of profound importance."

Page 155: "Coatings based on lean enamels are hard and take a good polish, but have poor weather resistance. Enamels on a rich base give coatings which are elastic and weather resistant, but they have a poor finish."

Page 158: "The good adhesion of urea- and melamine-formaldehyde resins makes it possible to use them successfully as primers."

Page 162: "To obtain a weather-resisting finish, 3–4 coats of enamel must be applied on one coat of primer. For water and chemical resistant coatings, not less than 5–6 coats are applied. In certain cases the number of coats is increased to 10–12."

The use of this book to give polymer chemists a background in coatings technology would be worse than useless. On the other hand, if the book truly reflects the state of the painting art in Russia, that knowledge should be worth at least two U-2 flights.

Harry Burrell

Interchemical Corporation
Finishes Division
Cincinnati, Ohio

Organic Coating Technology. Vol. II. Pigments and Pigmented Coatings. HENRY FLEMING PAYNE, Wiley, New York–London, 1961. viii + (675–1399) pp. $17.50.

This second volume of Payne's *Organic Coating Technology* has been anxiously awaited by many of the users of Volume I. They will not be disappointed. Take a dedicated man who has not merely "spent" but devoted a lifetime to his field, who has a passion for teaching and the ability to communicate, and who has the energy and ability to organize the data concerned with a very complex technology—there you have Henry Fleming Payne as revealed in his new volume.

The book opens with a concise chapter on "Fundamentals of Pigmented Coatings," which surveys the effect of pigmentation on the appearance, application, and durability of coatings. It is amazing how many of the practical considerations which must be met daily by paint chemists have been crammed into this short chapter. Naturally, a detailed discussion is limited by space, but the excellent bibliography at the end of this as well as each of the other chapters allows the reader to go as deeply into the subject as he desires.

The next six chapters cover the properties of a wide variety of white, colored, and inert pigments. While this section may be of less direct interest to polymer chemists, it provides important background information to those interested in the application of polymers in coatings.

The chapter on "Principles of Formulation and Production" is a propaedeutic for paint manufacture. It discusses the relationships of vehicle, pigment, and additives and reviews all of the important commercial equipment used to combine these ingredients into paint. While again the limitations of space prohibit an exhaustive treatment, there is probably no better source for the neophyte to acquaint himself with the subject and even veterans may profit by the organized presentation.

The next chapter, "Preparation of Surfaces and Methods of Application," is indispensable for those who would understand the importance of applied rheology. Probably in no other industry are the demands on theory of flow as great. The multifarious methods and apparatus used to apply coatings to a wide variety of substrates are all discussed here in sufficient detail to allow a fundamental appreciation of the problems and difficulties likely to be encountered. Even the newer types of equipment such as curtain coaters are included.

The last three chapters cover formulation of architectural, industrial, and resistant coatings. Here the billions of words that have been written in patents, trade journals, and manufacturers' bulletins have been carefully edited and distilled. Certainly no one interested in the utilization of polymers could find a better survey of paint products as they are consumed by our complex civilization. Those unfamiliar with coatings will be impressed by the variety and intricacy of some of the end uses. Even chemists with years of specialized experience can profit by reviewing the progress in related applications.

The book closes with a combined index for Volumes I and II which are paginated consecutively.

Organic Coating Technology can be unqualifiedly recommended to all who are in any way interested in paint.

Harry Burrell

Interchemical Corporation
Finishes Division
Cincinnati, Ohio

ERRATUM

A Proposed Method for Estimating Polymer Molecular Weight Distribution Without Fractionation

(*J. Appl. Polymer Sci.*, **4**, 95, 1960)

by JOHN REHNER, JR.

Chemicals Research Division, Esso Research and Engineering Company, Linden, New Jersey

Equations (9) through (12) contain a mathematical error which on correction yields

$$w_s = \{a^{1/b}bM_0\Gamma[2 - (1/b)] - b\rho\}/(M_0 - b\rho) \quad (10')$$

$$b = M_0(w_{s1} - w_{s2})/[\rho_2(1 - w_{s2}) - \rho_1(1 - w_{s1})] \quad (11')$$

and

$$a^{1/b} = [w_sM_0 + b\rho(1 - w_s)]/bM_0[2 - (1/b)] \quad (12')$$

However, application of these corrected equations to the data of Tables I and III gives b values some 10^3 as large as the literature values cited.

In order to determine whether the Tung function might in some way be responsible for these unacceptable results, we have repeated the derivation, using the Schulz distribution

$$w_y = [z^{k+1}/\Gamma(k + 1)]y^k \exp\{-zy\} \quad (2')$$

instead of eq. (2). Here the parameters are related to the number- and weight-average degree of polymerization by

$$z = k/\bar{P}_n = (k + 1)/\bar{P}_w \quad (2'')$$

When eq. (2′) is inserted in eq. (1), along with the approximation $[1 - \rho(1 - w_s)]^y \cong \exp[-y\rho(1 - w_s)]$, and the summation is changed to an integral with zero lower limit, we obtain

$$(w_s)^{1/(k+1)} = z/[z + \rho(1 - w_s)] \quad (14)$$

Simultaneous solution of the equations obtained by substituting two sets of experimental values of ρ and w_s into eq. (14) yields z for any chosen value of k. Substitution of z and w_s (exp) into the right member of eq. (14) yields a calculated value of the left member. By plotting $[w_s\,(\text{calc.})/w_s\,(\text{exp.})]^{1/(k+1)}$ against k, one can obtain the k value at which w_s (calcd.) = w_4 (exptl.). Application of this method to the crosslinked polystyrene data of Table III yields $k = 0.42$ and $z = 1.18 \times 10^{-4}$. The $\bar{M}_n$ value obtained by substituting these parameters into eq. (2″) is 370,000; this agrees fairly well with the value of 300,000 reported by Boyer and Spencer for their polystyrene made without addition of divinylbenzene to the polymerizing system. The polydispersity ($\bar{P}_w/\bar{P}_n$) according to eq. (2″) is 3.4. Boyer and Spencer did not report a value for this quantity, but our value is higher than that (1.4) reported by Booth and Beason for a different sample of polystyrene. Application of the present method to the SBR data of Table I failed to yield any positive value of k which satisfied the data. We are unable to explain this result at present.

We are indebted to Dr. A. M. Kotliar for bringing the above error to our attention, and for several valuable suggestions.