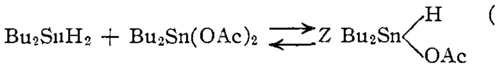
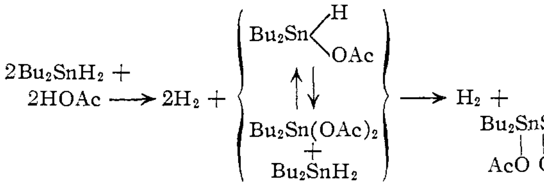
five hours and, at the end of 18 hours, a compound with properties identical to those of II was isolated in 91% yield. Similarly, reaction between I and di-*n*-butyltin dibenzoate yielded tetra-*n*-butylditin dibenzoate in 48% yield.

Upon mixing di-*n*-butyltin dihydride and di-*n*-butyltin diacetate the infrared spectra showed that, in addition to the Sn–H band of the dihydride at 1835 cm.$^{-1}$, a new band appeared at 1875 cm.$^{-1}$ immediately. The relative intensities of the two bands varied readily with temperature suggesting the establishment of the equilibrium represented by equation (4). If, immediately after its preparation, this mixture was cooled to −70° a solid was formed which, when recrystallized several times from anhydrous ether at −70°, gave a substance whose tin and hydride hydrogen analyses corresponded to those for di-*n*-butylacetoxytin hydride. *Anal.* Calcd. for $C_{10}H_{22}O_2Sn$: Sn, 40.51; hydride H, 0.34. Found: Sn, 40.60, 40.68; hydride H, 0.33. In the reaction of one mole of di-*n*-butyltin dihydride with one mole of acetic acid, after evolution of one mole of hydrogen, a reaction mixture was obtained whose infrared spectrum was similar to that of the mixture obtained on mixing the reactants of equation (4). In both cases the rates of gas evolution and changes in infrared spectra were similar as the mixtures reacted to form ditin and hydrogen. These observations suggest a common pathway for the formation of ditin from both pairs of reactants, hydride–acetate and hydride–acid. The overall process for the hydride–acid reaction may be represented as shown in equation (5).



$$Bu_2SnH_2 + Bu_2Sn(OAc)_2 \rightleftarrows Z\ Bu_2Sn\begin{matrix} \diagup H \\ \diagdown OAc \end{matrix} \qquad (4)$$



$$2Bu_2SnH_2 + 2HOAc \longrightarrow 2H_2 + \left\{ \begin{matrix} Bu_2Sn\begin{matrix} \diagup H \\ \diagdown OAc \end{matrix} \\ \uparrow\downarrow \\ Bu_2Sn(OAc)_2 \\ + \\ Bu_2SnH_2 \end{matrix} \right\} \longrightarrow H_2 + \begin{matrix} Bu_2Sn & SnBu_2 \\ | & | \\ AcO & OAc \end{matrix} \qquad (5)$$

When diphenyltin dihydride[3] was used the product isolated was the ditin regardless of whether the acid/hydride ratio was 1.0 or 2.0. With this hydride analytically pure ditins were obtained with these carboxylic acids in the yields indicated: acetic (75%), monochloroacetic (83%), dichloroacetic (75%), trichloroacetic (35%), trifluoroacetic (32%), benzoic (68%), *o*-chlorobenzoic (47%), *o*-hydroxybenzoic (32%), hexanoic (49%), and octanoic (7%).

Another method for the preparation of 1,2-diacyloxyditins is illustrated by the reaction of diphenyltin with benzoyl peroxide to give slightly impure 1,1,2,2-tetraphenyl-1,2-dibenzoyloxyditin (81%), m.p. 172–179°. The analytical sample recrystallized from benzene melted at 184–185°. *Anal.* Calcd. for $C_{38}H_{30}O_4Sn$: C, 57.92; H, 3.84; Sn, 30.12. Found: C, 57.82; H, 3.79; Sn, 30.25, 30.28.

Tetra-*n*-butyldiacyloxyditins show normal melting behavior, whereas the tetraphenyldiacyloxyditins generally melt with decomposition. In the case of 1,1,2,2-tetraphenyl-1,2-diacetoxyditin two of the products formed on melting were found to be stannous acetate and tetraphenyltin.

1,1,2,2-Tetra-*n*-butyl-1,2-diacetoxyditin lost 12% of its ditin content (as revealed by decrease in bromine titer) on exposure to air for one day, whereas 1,1,2,2-tetraphenyl-1,2-diacetoxyditin showed no measurable loss of ditin content over 48 days.

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[3] (a) H. G. Kuivila, A. K. Sawyer, and A. G. Armour, *J. Org. Chem.*, in press. (b) A. E. Finholt, A. C. Bond, Jr., K. E. Wilzbach and H. I. Schlesinger, *J. Am. Chem. Soc.*, **69**, 2692 (1947).

BOOK REVIEWS

Magnesium and its Alloys. By C. SHELDON ROBERTS, Fairchild Semiconductor Corporation, Palo Alto, California. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1960. xi + 230 pp. 15.5 × 23.5 cm. Price, $9.00.

A primary aim of the book is to relate the properties, characteristics and processing technology of these materials to principles of modern solid-state metals science. The aim is reflected in the organization. Of nine chapters, 1 through 5 are concerned primarily with topics of the metals-science variety: (1) Physical Properties of Magnesium, (2) Alloy Theory and Properties, (3) Magnesium Alloy Systems, (4) The Deformation of Magnesium, (5) Time-Temperature-Dependent Alloy Phenomena. The next three chapters are organized more around problems of processing and applications, attempting at the same time to preserve some continuity with earlier chapters: (6) Casting Alloys and Technology, (7) Wrought Alloys and Technology, (8) Chemical Properties and Applications. The final Chapter 9 on The Extraction and Refining of Magnesium is effectively done and gives useful supplementary background for the balance of the book.

This broad subject is well worth the effort that it must have cost the author who has done a sound job on a difficult assignment. The book is neatly prepared and attractively illustrated. Referencing is detailed and current and there is much value in having brought together the results of numerous investigations at the Metallurgical Laboratory of The Dow Chemical Co., especially those that have never before been published.

The philosophy of the book is clearly in accord with the current and widespread concern over developments in the field of materials science. The result is a good example of how far matters have progressed in blending science and technology in a recognized branch of metallurgy. To use words of the author from the Preface, he has shown that it is possible "to link the two areas in more than a casual manner." Yet it is still evident that the areas are far apart in many places of practical interest.

The author also aims for concise presentation and a modern audience. Apparently this is the basis for the occasional practice of introducing subjects abruptly with the more recondite first and the better defined experimental issues following later. For many engineers still becoming re-oriented in the direction of present-day materials science, this will make difficult going at various places. However, if these individuals are interested and do persist they will find the effort well worthwhile. On the whole, the book is an up-to-date readable account from a highly competent person of a fascinating story about an important group of engineering materials.

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The Chemistry of Natural Products. Volume IV. The Natural Pigments. By K. W. BENTLEY, Chemistry Department, University of Aberdeen, Old Aberdeen, Scotland. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. 1960. vii + 306 pp. 16 × 23.5 cm. Price, $5.00.

This is the fourth in a series of brief monographs on various areas of natural products chemistry. The pigment classes described are (1) pyran pigmentrs: flavones and flavonols, anthocyanins and anthocyanidins, xanthones, rottlerin, brazilin and hematoxylin; (2) pyrrole pigments: and porphyrins, the chlorophylls, the bile pigments, prodigiosin; (3) pyrimidine pigments: the pterins; (4) quinonoid pigments; and (5) polyene pigments.

Typical structure proofs are given for representative compounds in some of these groups and for the title compounds in others. Examples of the syntheses of individual substances are chosen to illustrate generally applicable synthetic methods. The examples used are well chosen, and the steps used in the description or structure determination are plainly described with the aid of clear and legible structural formulas. The treatment is spare and succinct but adequately self-explanatory.

A remarkable number of individual compounds are treated within the pages of this rather short work. The degree of detail in the description of the structural chemistry is indicated by the number of structural formulas that are used in illustration of the text: in the section on polyenes the final formula in the chapter is numbered CCLXXVII. It is, however, a pity that the author chose to use roman numerals for his illustrations; the text would be a great deal easier to follow if a formula were numbered (143) instead of (CXLIII).

This book will serve as an admirable complement to more encyclopedic works on the one hand and, on the other, to those that treat not only of the chemistry of the pigments but their biological aspects as well. The reviewer has some small regret that a compound must be colored to gain entrance into the book, for many of the classes of compounds described in it are but segments of larger groups of structurally related substances, many of them colorless. It is unlikely, for instance, that one would write a book that dealt only with colored alkaloids.

These are minor criticisms. The book achieves its aim to describe in comprehensible detail the course of many interesting and infomative structural investigations. The book's educational value for the advanced student should be very high, and to the research workers in the fields that are dealt with it should serve as a convenient source of reference to a multitude of detail.

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An Introduction to Chemical Nomenclature. By R. S. CAHN, M.A., Dr. Phil. nat., F.R.I.C., Editor to The Chemical Society, London. Butterworth and Co. (Canada) Ltd., 1367 Danforth Avenue, Toronto 6, Ontario, Canada. 1959. viii + 96 pp. 12.5 × 18.5 cm. Price, $2.25.

Nomenclature is one of the important tools of chemistry. It is the means by which chemists describe their compounds to one another. Like other tools it can be used in several ways and it can be misused. Well qualified by experience as editor of the "Journal of The Chemical Society" (London) and a member of an international nomenclature commission (IUPAC), the author in this introduction to chemical nomenclature discusses the principles of modern systematic nomenclature, based primarily on the recent IUPAC reports. Approximately one-third of this treatise is devoted to inorganic nomenclature, the rest to organic nomenclature, with five pages devoted to physicochemical symbols. A useful index is included. The nomenclature recorded is that accepted by The Chemical Society (London). Differences between British and American practices are noted.

In the inorganic section the following subjects are covered: names and symbols of the elements; compounds between two elements; pseudo-binary compounds; extended coördination principle; acids and normal salts containing more than two elements, including a list of trivial names; ions and radicals; salts and salt-like compounds; coördination compounds; isopolyanions; heteropolyanions; addition compounds, including solvates.

The organic part is of special value in showing how rules are applied in building a name. Principles, more than rules, are stressed. Thus the principal functional group sets the whole pattern of nomenclature and numbering and it is vital to fix that group before anything else is done. Conventions such as punctuation, placement of locants, use of italics, order of prefixes, and elision are discussed. The numbering and naming of cyclic systems are explained.

Except for a series of incorrect formulas for glycolic acid and its thio derivatives, the book is remarkably free of errors.

This small book is a valuable guide to correct nomenclature for the research chemist as well as the teacher and student of chemistry.

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