

Solutions of palladium chloride and silver nitrate gave immediate yellow precipitates when mixed with dilute hydrochloric acid and nitric acid solutions of the diazaphenanthroline, respectively. *Anal. Calcd.* for  $\text{Ag}_3(\text{C}_{12}\text{H}_{10}\text{N}_4)_4(\text{NO}_3)_3$ : C, 42.64; H, 2.96; N, 19.70; Ag, 24.02. Found: C, 42.93; H, 3.14; N, 19.22; Ag, 24.06. Calcd. for  $\text{Pd}(\text{C}_{12}\text{H}_{10}\text{N}_4)\text{Cl}_2$ : C, 37.16; H, 2.58; N, 14.46; Cl, 18.33; Pd, 27.46. Found: C, 37.61; H, 2.77; N, 14.76; Cl, 15.75<sup>4b</sup>; Pd, 26.70 (from residue).

The ligand to metal ratio for the silver complex (which was the same in three separate preparations) is in contrast to that found with benzocinnoline presented in this paper but is in agreement with the results obtained by other workers with azobenzene.<sup>2</sup> In one preparation the sample was stirred 24 hr. before filtration. In this case there was no significant change in the elemental analysis.<sup>9</sup> These complexes were all infusible (>300°) materials. The silver complex was

(9) This was also true for the palladium complex.

soluble in hot dimethylformamide, but the palladium complex was insoluble in this solvent or nitrobenzene at the boiling point. The infrared spectra of these two compounds were very similar to that of the ligand itself. The low solubility of the palladium complex and 1:1 ligand:metal ratio suggest a polymeric-type compound which could occur if both the azo group and the "methine chromophore" are interacting with the metals. Benzocinnoline gave a 2:1 ligand ratio for the palladium complex where polymer formation is not likely.

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## Book Reviews

**Künstliche Organische Farbstoffe und Ihre Zwischenprodukte.** By HANS RUDOLF SCHWEIZER, Dr. sc. techn. ETH. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf (West), Germany. 1964. xii + 542 pp. 16 × 24 cm. Price, DM 49.60.

In revising his earlier, two-volume work ("Künstliche Organische Farbstoffe," Verlag der Vereinigung der Chemiestudierenden der Eidgenössische Technische Hochschule, Zurich, 1959), the author has aimed at providing German-speaking students with a modern, comprehensive textbook on the chemistry of dyes and their intermediates. Comparison with other recent attempts in this direction, by Seidenfaden in 1957 and Schaeffer in 1963, shows decisive improvement. But the result is short of the goal even when the relative paucity of basic research in this field is taken into account. This failure may well be rooted in the catalog-like nature of the book, which includes topics of importance in Victorian times, but not now.

The book is organized in three sections: the application of dyes to textiles, or dyeing; intermediates; and colored compounds, including both dyes and pigments. The first section outlines dyeing technology, the various substrates and auxiliary products, as well as apparatus, but is so much a compendium of isolated and often irrelevant information that one gets the impression that the author has little more than second-hand knowledge in this field. This is disappointing since contemporary research calls much more for an understanding of the chemical and physical properties of dyes in solution and on substrates than mere search for new chromophoric systems.

The section on intermediates is adequately done. Sufficient mechanistic emphasis is given to awake some imagination on its utility in process rationalization, although this is not stressed.

The third and longest section presents dyes and pigments according to the classical approach. Such recent developments as reactive, 2:1 metal complex, phthalocyanine precursor, and polymerizable dyes are treated for the first time in a general textbook. Disappointingly, some space is given to pharmaceutical and insecticidal examples, when it more properly could have been devoted to the important areas of water-soluble sulfur, and azo and anthraquinone cationic dyes, which received little or no attention. Neither is there a serious attempt to correlate structure and properties, nor a sufficient explanation in modern terms of old termi-

nology, e.g., basic or acid dyes. Attention to these matters would have materially aided in arousing real interest for the subject in Hochschule chemistry students.

While the book is an improvement in the Germanic literature, it is less successful when compared to English-language competition. If an English translation were ever undertaken, a thorough revision would be indicated.

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**Nuclear and Radiochemistry. Second Edition.** By GERHART FRIEDLANDER, Senior Chemist, Brookhaven National Laboratory, JOSEPH W. KENNEDY, Late Professor of Chemistry, Washington University, and JULIAN MALCOLM MILLER, Professor of Chemistry, Columbia University. John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. xi + 585 pp. 17.5 × 24.5 cm. Price, \$10.75.

Among other expectations of the postwar world—everyone owning his own helicopter, and so on—was the importance nuclear and radiochemistry was to have in the college and graduate chemistry curriculum. Unfortunately, the dilapidations of time have been such that despite the *de rigueur* inclusion of the usual chapter at the end of the usual textbook of freshman chemistry, the teaching of radiochemistry has become a chore that chemists expect the departments of physics to perform. So it comes about that a new edition of perhaps the best of the advanced texts of nuclear chemistry waits nearly a decade for publication, and its review is only reluctantly accepted by the Editor of the *Journal of the American Chemical Society*.

I shall confine myself to changes from the first edition (itself a revision of "Introduction to Radiochemistry," published in 1949): first, an increase in size by roughly a third (is the second edition ever smaller?) due in part to a thorough job of redesigning to give the book a much more attractive format. Professor J. M. Miller has replaced the late Joseph W. Kennedy of Washington University as author. Two new chapters have been added: "Nuclear

Models and Nuclear Processes" and "Chemical Probes" which discusses the Mössbauer effect. Many of the old sections have been expanded and in addition much of the copious reference data at the end of the chapters date from this edition alone. The publisher's claim that *ca.* 50% of the second edition is newly written material is believable.

The story of Becquerel's discovery of radioactivity on page 1 remains incorrect, and the uranium salts he examined were fluorescent rather than phosphorescent. Again the neutron activation analysis sensitivities are off by a factor of  $10^5$ . The power and neutron flux of "representative reactors" have increased in the last ten years as have the maximum biologically permissible doses listed in the tables. And to conclude on a happy note, hydrogen and cobalt bombs are no longer to be found in the index!

The book is highly recommended.

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**Friedel-Crafts and Related Reactions. Volume II. Parts 1 and 2. Alkylation and Related Reactions.** By GEORGE A. OLAH, Research Scientist, Dow Chemical of Canada, Ltd., Sarnia, Ontario. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. 1362 pp. 16 × 24 cm. Price, \$50.00.

In planning the four-volume work of which this is a part, the editor and authors were confronted with a basic problem: what catalysts and what reactions should be included? Chemists will applaud their decision, which is reflected in the title, to attempt the difficult task of correlating a broad spectrum of catalytic reactions now recognized to be related—"any substitution, isomerization, elimination, cracking, polymerization, or addition reactions taking place under the catalytic effect of Lewis acid type acidic halides (with or without cocatalyst) or proton acids." Thus the reactions included are both aliphatic and aromatic, and the catalyst systems include Lewis acids and Brønsted acids, solid acids and liquid acids, halide acids and hydrous oxides. The scope of this work is a measure of the tremendous recent progress in our understanding of this area of organic chemistry.

Volume II covers, in the first of two separately bound parts, the alkylation of aromatics (including heterocyclics) with alkenes, alkanes (*via* cracking of the latter), cycloalkanes, dienes, alkynes, haloalkanes, alcohols, ethers, aldehydes, ketones, and esters of inorganic acids and of arylsulfonic acids. Part 2 covers haloalkylation, cycloalkylation (involving intramolecular ring closure), dehydrogenation condensation of aromatics (Scholl reaction), isomerization of aromatic and of saturated hydrocarbons, alkylation of saturated hydrocarbons, condensation of haloalkanes with alkenes and haloalkenes, alkylation of alkenes with carbonyl compounds (Prins reaction), hydrogen exchange in aromatic compounds, and cationic polymerizations.

Within the area covered, the editor and authors have sought to provide, not total coverage of all work done, but a reasonably complete summary of data, particularly those which have significance; an evaluation of the data in the light of theoretical concepts; and correlations which will be of aid to the preparative chemist.

In these aims, nearly all of the contributing authors have succeeded admirably. Thus all but a few of the shorter chapters are replete with detailed summary tables in which are listed, in systematic form, reactants, catalysts, operating conditions, and products. The material generally covers the period through 1960, and there are occasional references as late as 1963.

But these factual summaries, in readily retrievable form, are by no means the only attractive feature of this work. There is thorough coverage of the catalyst systems and their complexes, of the reaction mechanisms involved in their action, and of the thermochemistry and kinetics of many of the reactions studied. The excellent balance between fact and theory will make this volume equally attractive to the student, to the research man who wishes to survey the prior art or look up a synthesis quickly, and to the chemist who wishes to brush up on current theories of acid catalysis in the areas covered.

Despite the general excellence of this volume, there are several respects in which it is deficient. Thus, there is only a short, rather generalized subject index to this volume, for which the rather detailed Table of Contents and the extensive tabular information are only partial compensation. A comprehensive author and

subject index are promised at the end of Volume IV; but it appears to this reviewer that anyone who spends \$50 for this volume is entitled to its complete indices without further expenditure.

Again, the editor has allowed the contributing authors to use their individual judgments in deciding the extent and manner of coverage of their topics. "Indeed," he writes, "it is hoped that each chapter will reflect to a certain degree the character and personality of its author." In spite of this latitude, there is more uniformity of approach than might have been expected, considering the diversity of backgrounds and points of view of the authors, who were drawn from seven countries and about equally from universities and industry. In a few cases, however, the coverage might have been improved if the editor had persuaded the authors to conform to the practices of most of the contributors.

The coverage of patents is a case in point. Of the 17 chapters in this volume, 13 include references to significant patents, particularly "if they contained examples supplying a fair amount of experimental detail." The authors apparently felt qualified, as experts in their fields, to select from the patent literature material of validity and pertinence. The contributors of four chapters chose to ignore the patent literature, although at least two of the fields covered are of considerable industrial importance. Several significant recent developments have therefore been omitted.

Despite these shortcomings, Volume II of this series is a major contribution to the current literature on catalysis, which will be welcomed as a valuable tool by chemists everywhere.

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**Les Triterpénoïdes en Physiologie Végétale et Animale.** By P. BOITEAU, B. PASICH, and A. RAKOTO RATSIMAMANGA. Gauthier-Villars, 55 quai des Grands-Augustins, Paris, France. 1964. xi + 1370 pp. 16.5 × 25 cm. Price, 310 F.

The title of this book does not indicate its wide scope. This monumental work is doubtlessly the most exhaustive and complete survey of triterpenoids that has appeared until now, every conceivable aspect of the subject being covered in considerable detail.

The book is divided into eight chapters, several of which are of such breadth that they could well have been published as separate monographs. The scope of the book can be judged by a short summary of the contents of each chapter. Chapter I (27 pp.) deals with the definition, biosynthesis, classification into groups, and nomenclature of triterpenoids. Chapter II (375 pp.) consists mainly of a list of every naturally occurring triterpene, with the structure where known, physical properties, derivatives, and references. A particularly welcome feature here is a separate list of triterpenes of unknown structure, which will doubtlessly attract the attention of workers wishing to find research problems in this field. Chapter III (106 pp.) covers all aspects of extraction, purification, and estimation of triterpenes. Various chromatographic and spectroscopic analytical techniques are discussed in detail, as well as color reactions, etc. Chapter IV (208 pp.) describes the various methods used in structure determination, both physical and chemical. This chapter ends with a useful account of the properties and reactions typical of the different groups of triterpenes. Chapter V (232 pp.) gives a systematic account of the distribution of triterpenes in the animal and plant kingdoms. Chapters VI (38 pp.) and VII (341 pp.) describe the role of triterpenes in plant and animal physiology, respectively. Aspects of biosynthesis and bioconversion are discussed. In particular, a very full account of the various biological activities of the different groups of triterpenes is presented. Finally, Chapter VIII (14 pp.) gives some hypotheses regarding the biological properties of the triterpenes.

There are many valuable tables and compilations of data throughout the volume. Triterpenoids are classified in several ways; *e.g.*, according to name, functional groups, empirical formula, melting point, and optical rotation. A table of contents appears at the end of the book, but no general subject or author index. This omission is unfortunate, since such indices would have been of considerable help in locating a particular topic.

Comparatively recent work is included, references up to 1963 being given. There are several tables of addenda, mainly referring to work published in 1962 and 1963.

The book is probably rather longer than necessary, since at times a subject is discussed in more detail than appears justified.