Fe^{III}, expressed in moles of H_2O_2 decomposed per min. per mole of (TETA)–Fe^{III}, were computed from the initial rates of decompositions of H_2O_2, and are summarized in Table I. In order to correct for traces of Fe^{III} present in the system as an impurity (from reagents and glassware), a blank measurement with TETA and H_2O_2 but without added Fe^{III} was made at each temperature. These blank rates were subtracted from the corresponding measured rates before the computations for turnover numbers were made. The activation energy for the reaction computed from Table I is 6.6 kcal./mole. Results of a detailed study on the subject will be reported in a later publication.

TABLE I

CATALYTIC DECOMPOSITION OF H_2O_2 BY (TETA)–Fe^{III}

Concn. of Total TETA, mole/l.	Concn. of Total Fe^{III}, mole/l.	pH	Temp., °C.	Turnover number min.$^{-1}$
2.9×10^{-3}	3.8×10^{-7}	9.5	25.2	11000
2.9×10^{-3}	5.7×10^{-7}	9.6	25.2	11000
2.9×10^{-3}	7.6×10^{-7}	9.6	25.3	11000
2.9×10^{-3}	3.8×10^{-7}	9.5	1.8	4400
2.9×10^{-3}	3.8×10^{-7}	9.5	13	6700
2.9×10^{-3}	3.8×10^{-7}	9.5	41.5	21000

Although (TETA)–Fe^{III} is not as efficient as natural catalases, these data show that it is possible to construct small molecules with turnover numbers in the enzymic range.

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BOOK REVIEWS

Einschlussverbindungen. By FRIEDRICH CRAMER, Dozent am Chemischen Institute der Universitat Heidelberg. Springer-Verlag, Reichpietschufer 20, Berlin W 35, West Berlin, Germany. 1954. iv + 115 pp. 14 × 21 cm. Price, DM 14.80.

This ably written and documented monograph (167 references) brings together the present available information on a relatively new and remarkable type of compound to which Schlenk in 1949 gave the name "Einschlussverbindungen" or *inclusion compounds*. These are the compounds which involve purely a spatial combination between partners, involving no principal or secondary valences. One kind of molecule is simply trapped within open spaces created by the other and cannot escape. Inclusion compounds are classified as formed by crystal lattices, by molecules and by macromolecular materials. Examples of the first are the adducts of urea with *n*-paraffin derivatives (canal "hohlraum"), thiourea with cyclic hydrocarbons (canal), desoxycholic acid with paraffins, fatty acids and aromatics (canal), dinitrodiphenyl with diphenyl derivatives (canal), hydroquinone with HCl, SO_2, C_2H_2, rare gases (cage), gas hydrates (halogens, rare gases, CH_4, etc.) (cage), *o*-trithymotide with cyclohexane, benzol, chloroform, (cage), oxyflavane with organic bases (cage), dicyanoamminobenzolnickel with benzol, thiophene, furane, pyrrol, aniline (cage), and substances which form blue iodine adducts (canals). The only example of a fairly low molecular weight compound which provides an inclusion space in a single molecule is cyclodextrin. The space is a canal, or in solution a cage, enclosing hydrocarbons, iodine, alcohols, halogenated paraffins, aromatic compounds and dyestuffs. Macromolecular materials forming inclusion compounds are minerals such as zeolites and clay minerals, graphite, cellulose, starch and proteins (inclusion of dyestuffs, lipoids, etc.). For most of these cases X-ray crystal structure data are summarized, together with absorption spectra data directed to the question whether the included molecules are completely unchanged in the canals or cages. Trapping and trapped molecules cannot be separated, hence inclusion compounds are especially stable when the system possesses high electron density. Hence the "hohlraum" may serve as an electron donor and as a base in the Brönsted–Lewis sense. Also negative and positive catalysis by inclusion compounds might be expected, and examples are cited; and these also serve as models for ferment reactions (especially cyclodextrin). The criteria for the building of inclusion compounds are summarized as a means of prediction of new systems. The author has clearly demonstrated his mastery of the synthesis and theory and properties of these curious compounds in which one kind of molecule imprisons another tightly but is not chemically combined with it. Incidentally, the term "clathrate" for this type of compound is not mentioned.

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An Introduction to Electronic Absorption Spectroscopy in Organic Chemistry. BY A. E. GILLAM, D.Sc. (Liverpool), F.R.I.C., Late Senior Lecturer in Chemistry, and Special Lecturer in Chemical Spectroscopy, The University, Manchester and E. S. STERN, Ph.D. (London), A.R.C.S., Chief Research Chemist, J. F. Macfarlan and Co., Ltd., Edinburgh. St. Martin's Press, Inc., 103 Park Avenue, New York 17, N. Y. 1954. vii + 283 pp. 15 × 22.5 cm. Price, $8.00.

The organic student who nowadays must have a working knowledge of ultraviolet spectroscopy in relation to organic structural problems will find in this book a relatively easy and painless means of achieving this objective. And since the book was presumably intentionally limited to this specific objective we shall not carp about the rather inadequate theoretical discussion nor about the failure to review fully developments of the last three or four years.

Beyond a passing mention of valence-bond theory and molecular orbital theory, the treatment is descriptive, factual and frankly empirical. The index contains not a single entry under either "Selection Rules" or "Symmetry Characters." Absorption bands are K, R or B, each characterized by its own set of rules or generalizations as to the effects of solvents, substituents, conjugation, etc. This characterization serves the purpose of convenience, if not understanding, in cataloging the relationships between structure and absorption spectra for a considerable variety of organic compounds. The text is well-supported by tabular data, figures and literature references.

The style is free and easy, occasionally to the point of absurdity, as, to quote a particularly glaring example (p. 67), "The generalization that two chromophores separated by a carbon atom interact but little does not necessarily apply when the atom separating the two groups is not carbon: thus. . . ."

The authors are at their best in describing the applications of spectroscopic methods in specific situations as, for example, in the chapter (Chapter 12) dealing with the spectrophotometric determination of organic compounds, and again in the chapter (Chapter 14) containing the data and the arguments actually applied in representative structural problems. The student will derive much benefit from working through these problems.

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The Structures and Reactions of the Aromatic Compounds. BY G. M. BADGER, D.Sc., Ph.D., F.R.I.C., Reader in Chemistry in the University of Adelaide. Cambridge University Press, American Branch, 32 East 57th Street, New York 22, N. Y. 1954. xii + 456 pp. 15 × 22.5 cm. Price, $11.50.

It is the author's aim in this book to produce "a survey of the whole field of aromatic chemistry." Rather careful reading leaves one with the impression that he has achieved his object quite satisfactorily.

After consideration of the benzene problem and its theoretical solution, there follows a discussion and definition of the term "aromatic compound." The definition of an aromatic substance as "a cyclic compound with a large resonance energy where all the annular atoms take part in a single conjugated system" makes it possible to include such "non-benzenoid aromatic hydrocarbons" as the azulenes, and to consider tropolone and certain heterocyclic substances.

The book is primarily descriptive; it is concerned with the reactions and theory which involve directly the aromatic ring. Thus, addition reactions, the aromatic "double" bond, the effect of substituents, aromatic substitution reactions, the Diels–Alder reaction, photoöxidation and photopolymerization, absorption and fluorescence spectra, and optical activity are treated in successive chapters. As might be expected the space devoted to substitution reactions (97 pp.) is greater by a ratio of about two to one than that devoted to any other chapter. Adequate references to the literature through 1951 will make this work particularly useful to graduate students and research workers.

Clear, lucid writing, and excellent typography in a well bound volume combine to make this new work a very worthwhile addition to the literature of organic chemistry.

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Verfahrenstechnik in Einzeldarstellungen. Volume 2. **Die Kristallisation in der Verfahrenstechnik.** By Dr. PHIL. NAT. GUNTHER MATZ. Springer Verlag, Berlin W 35, Reichpietschufer 20, West-Berlin. 1954. viii + 194 pp. 15.5 × 23.5 cm. Ladenpreis: DM 19.50.

This reviewer, like most chemists, occasionally has used crystallization on a small scale in the laboratory but has no specialized knowledge of its theoretical or experimental status nor does he know anything of its application in chemical industry. Reading of this book thus promised to be rewarding, for the author's purpose, as stated in his preface, was to supply such information. Written for the student and the practicing engineer, physicist and chemist, it presupposes little except elementary thermodynamics and a slight acquaintance with calculus.

The book is divided into two main parts: the first, about 70% of the text, deals with the theoretical foundations of the subject; the second part describes briefly various types of crystallizers used in industry. A short appendix on size distribution in crystallites, a bibliography and subject–author indexes complete the book. Presentation of the material is clear and it is logically organized; the German is relatively easy to read, and the technical details appear to be authoritative.

The author believes that the science of crystallization has developed rapidly in the last twenty-five years, stimulated by Madelung's calculations of the lattice energy of salt in 1918, theories of Kossel and Stranski on lattice structure, and the crystal growth theories of Volmer, Beck and others. Technical progress, on the other hand, he believes was slow until the time of the second world war. These conclusions are undoubtedly true but a comparison of the results presented here with those known for distillation, absorption, extraction, or other separation processes used industrially shows that our knowledge of crystallization is quite insignificant. The author recognizes this fact and attempts to explain it. Although the ultimate purpose, in each case, is separation, he believes that there are few similarities between crystallization and the other processes. He offers several thermodynamic arguments to show that crystallization is essentially more difficult in principle than the others.

If this book gives a representative picture of the status of the subject, there may be further reasons for the unsatisfactory situation, for the experimental data quoted are astonishingly meagre. Only nine tables and 58 figures are needed and many of the latter are diagrams of equipment, while others have little, if any, quantitative significance. It follows necessarily that the theories developed from such data, with few exceptions, are expressed in a trivial mathematical form or in one difficult to test experimentally. One suspects that what is needed is a concentrated attack on the problem which would include a laborious, but well-planned, program of accumulating data.

The author states that sublimation is regarded as the stepchild of technical processes. It appears that crystallization is actually this unfortunate relation.

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