

cists by the announcement of the discovery by Hahn and Strassman of fission and Miss Meitner's explanation thereof, but the discovery came after four years of searching for the explanation of Fermi's transuranic elements and during that time not one of the great captains of physics, neither Bohr, nor Rutherford, nor others, had even considered the possibility of fission and the great release of energy which must accompany such disintegration. Those who lived through that period will never forget the intense excitement and speculation which occurred almost within days of the news; bombs and power stations at last appeared technically possible. This Hecht explains.

The author died in 1947 and Prof. Rabinowitch revised the book in 1954, recounting again the sad story of the attempts to establish international control of atomic weapons, and also describes the fusion of hydrogen into helium and its application in 'super-bombs'. Although *Explaining the Atom* has had some further revision, the peaceful applications of atomic energy are not adequately dealt with and there is little to indicate the vast strides which have been made in the past decade.

The illustrations do not match up to the excellent presentation of the facts. There are too few, some are drawn with errors, and when reference is made to them in the text, the page reference is not given so time is wasted searching for the appropriate illustration.

T. E. ALLIBONE

REDOX POLYMERS

Oxidation-Reduction Polymers

(Redox Polymers). By Harold G. Cassidy and Kenneth A. Kun. (Polymer Reviews, Vol. 11.) Pp. xv + 307. (New York and London: Interscience Publishers, a Division of John Wiley and Sons, 1965.) 95s.

OXIDATION-Reduction Polymers, the most recent addition to the well-known "Polymer Reviews" series of books dealing with individual topics in polymer science, is concerned with a relatively new polymer type containing chemical groupings which participate in electron exchange phenomena.

After a brief general review of the field, the synthesis of these polymers is discussed. The two major approaches are considered separately, namely the polymerization of a suitable monomer which contains appropriate redox groups or the chemical attachment of redox groups on a pre-formed polymer. To the former approach there are many obstacles, since the redox centres may be expected to interfere with the free radical, ionic or condensation polymerization. Individual examples are discussed in detail and techniques for blocking reactive groupings described so that the polymerizations are unaffected by inhibition or transfer reactions. The second approach of modifying a prepared polymer may be achieved by precipitating or adsorbing the redox material in an inert matrix, or by chemically bonding it to the polymer backbone.

The succeeding chapter gives a concise account of oxidation-reduction theory and the setting up of electrochemical cells for the measurement of electrode potentials. The special problems associated with insoluble redox resins are dealt with and also the use of mediators to overcome them. Typical titration curves for single substances and for mixtures are described and their interpretation discussed in detail.

The largest chapter in the book concerns the measurement of the properties of redox polymers. The principal difficulties of measurement are connected with the high molecular weight and hence relative insolubility of these systems. There is no discussion of the measurement of the usual polymer properties, the main interest lying in the electrical properties and microstructure. The apparatus used for carrying out potentiometric titrations is described in detail, together with that necessary for the control of

ambient conditions. In this connexion, it is of the utmost importance that reagents and solvents should be prepared in a standard way, and special difficulties arise since non-aqueous media must on occasion be used. It is also necessary to be able to define the micro properties of these polymers in terms of surface area, pore size, pore size distribution and pore structure, and here a number of conventional techniques with appropriate modifications can be applied. The measurement of redox capacity of a resin is also dealt with.

The properties of individual redox polymers are dealt with in a classified chapter in which polymers are separated according to mode of preparation, solubility and composition of the functional groups. The physical, optical and electrical properties are detailed and discussed in the light of the general theories elaborated earlier in the book.

The final section of the book deals with the applications of oxidation-reduction polymers in ion-exchange; in utilizing the self-buffering action of appropriate copolymers; as catalysts for the formation of hydrogen peroxide; for the de-oxygenation of water and reduction of boiler corrosion; for water purification and waste disposal as well as more specialized uses in biological studies; chemotherapy; photography; electric battery construction and as a dielectric. The authors also speculate on further uses of these substances.

In addition to the references which are provided for each chapter, there is an extensive annual bibliography dealing with not only works and articles but also patent applications. These references are also annotated in such a way as to provide a better indication of the content of individual items. The book is well illustrated where appropriate with diagrams and figures.

This specialized text will appeal to anyone engaged in the study of redox polymers and to those in the general field of polymerization who wish to get a clear, concise account of the special properties of these substances. As a source-book it will find much use by those who wish to extend present understanding and use of oxidation-reduction polymers.

JAMES C. ROBB

AERODYNAMIC AESTHETICS

Theory of Optimum Aerodynamic Shapes

Extremal Problems in the Aerodynamics of Supersonic, Hypersonic, and Free-Molecular Flows. Edited by Prof. Angelo Miele. (Applied Mathematics and Mechanics: An International Series of Monographs, Vol. 9.) Pp. xix + 455. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1965.) 132s.

APPLIED mathematicians approach their work in different ways. One way is to master and develop a particular mathematical technique and then apply it to as many physical problems as possible. Prof. Angelo Miele has followed this path with distinction; he is an authority on variational methods which he has applied to an extremely wide range of optimization problems in the fields of aerodynamics, flight mechanics and astronautics.

In *Theory of Optimum Aerodynamic Shapes* Prof. Miele restricts his attention to the determination of the external shape of bodies, subject to various geometrical constraints, giving minimum drag in certain flight régimes. At supersonic speeds optimum shapes of two-dimensional wings and bodies of revolution are discussed on the basis of linear and second-order aerodynamic theories, taking into account skin friction effects; optimum shapes for rocket nozzles are also described. At hypersonic speeds similar problems are solved assuming first the Newtonian pressure law and then the Newton-Busemann pressure law. A short section is concerned with the optimum-shaped body of revolution in free molecular flow.

The presentation of all this information is somewhat unorthodox. As an introduction, the first four chapters