

important to the nuclear reactor field are described from both the fabrication and application points-of-view.

This book has the special value of presenting the discussion of uranium technology from the vantage point of work in Great Britain. Because of this and the competence of the discussions of the metallurgy and production of metallic uranium for nuclear reactor fuel elements, this volume by Gittus can be recommended for the specialist in the nuclear reactor field.

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About the Reviewer: John M. Googin is actively engaged, at the Y-12 Plant in Oak Ridge, in the production of components for nuclear systems, including shields as well as fuel elements. He has had twenty years of experience in the chemistry and metallurgy of uranium and its alloys, as well as lithium, beryllium, boron, carbon, tungsten and thorium. He designed the first large-scale zirconium-hafnium separation plant.

Progress in Nuclear Energy, Series IV, "Technology, Engineering and Safety," Vol. 5. Edited by C. M. Nicholls. The Macmillan Company, New York (1963). 622 pp. \$17.50.

This book consists of 18 review articles on selected topics in nuclear engineering, 13 prepared by British and five by American authors. Although some of these articles are less comprehensive in scope than the titles suggest, they are of excellent quality and constitute valuable additions to the literature. Comments on the individual articles follow.

"Methods of Measuring Temperature in Nuclear Reactors" fulfills a real need for the consolidation of information on this subject in one convenient reference. The author's emphasis on the effects of transmutation on thermocouple composition is particularly worthwhile.

"Steels for Gas-Cooled Reactor Pressure Vessels: A Review of British Practice" does an admirable job of presenting important facets of a complex subject in a limited number of words. Recent data might justify a more optimistic treatment of transition shifts produced by neutron irradiation than was possible at the time this article was written.

"Compatibility Problems in Fast Reactors" is a well written summary of compatibility problems

in liquid Na and NaK. It contains no mention of lithium or of nonmetallic coolants for fast systems.

"Chemical Engineering Technology of Organic Cooled Nuclear Reactors" is a discussion of purification of organic coolants by distillation, adsorption, filtration, and degasification to remove products of radiolysis and pyrolysis. It is well organized and clearly presented in a form which should be easily followed by a chemical engineer having general knowledge of reactor technology.

"The Thermal Reactivity of Nuclear Grade Graphites to Oxygen" is an accurate and thorough review of the effects of graphite structure, chemical kinetics, gas diffusion, and irradiation on graphite oxidation in reactors. Although the safety aspects of the hazard of catastrophic oxidation are emphasized, the importance of slow oxidation over the reactor lifetime is given rather minor consideration.

"Transportation and Diffusion of Fission Products in Graphite" perhaps emphasizes too much theoretical models based on first principles and emphasizes too little prototypic in-reactor experiments. This may merely reflect the paucity of the latter data at the time of writing.

"Irradiation Damage in Beryllium Oxide" appears to be a good, comprehensive review of the subject matter as of the time of writing.

"Radiometric Techniques and Instrumentation for In-Line Process Monitoring" presents the basic principles of radiation measurement in excellent fashion. The status of process monitoring instrumentation in the U. K. appears to be covered very adequately. Additional information concerning operating experience and long-term reliability of the various in-cell monitors would have been useful to enable comparison with similar instrumentation in use in the U. S.

"The Separation of Plutonium Isotopes" is a readable, concise description of the electro-magnetic method, covering both theory and application. Other possible methods of separation are not considered.

"Development of a Production Process for Radio-Krypton Recovery by Fractional Absorption" describes a design and pilot plant study of a carbon tetrachloride solvent extraction process for the recovery of krypton.

"The Preparation of UO_2 - PuO_2 Powders for Nuclear Fuels" describes the work done at Harwell on the preparation of UO_2 - PuO_2 powders by coprecipitation from aqueous solutions and on the determination of the properties of those powders. It is interesting and instructive.

"Gas-Solid Contacting" presents an excellent review of the fundamentals of gas-solid contacting and of work done in Britain and Europe on the

conversion of UNH to UO_3 and of UO_3 to UF_4 . The applications of gas-solid contacting in fuel re-processing and waste disposal are given much more perfunctory treatment.

"Corrosion and Materials of Construction in Chemical Processing of Reactor Fuels" is a good summary of the subject. However, this reviewer questions the statement that type 309 SCb stainless steel is the nearly unanimous choice as the material of construction for dissolvers, since Hanford uses 304-L exclusively.

"Filtration of Radioactive Particulates" is a brief and readable description of theory and U. K. practices.

"Review of Engineering Research for the Development of High Temperature Reactors" discusses three central station, recirculating, helium-cooled power reactors—Dragon, HTGR, and the BBC-Krupp graphite pebble bed. It outlines the three reactor designs and the problem areas which they present but says little about the research and development being carried out to solve these problems.

"Parametric Survey of Critical Sizes" is an excellent summary of critical sizes of homogeneous, hydrogenous mixtures of uranium and plutonium. It is worth noting that some of the missing data for plutonium systems to which the author refers have been obtained subsequent to the cut-off date of the paper.

"The Particulate Material Formed by the Oxidation of Plutonium" presents an excellent discussion of the oxidation of plutonium and of radiological hazard to the lungs from plutonium oxide. It is the first comprehensive treatment of this subject.

"The Response of Containment Structures to Transient Pressures Caused by Nuclear Reactor Runaway" is a good review of the state-of-the-art of predicting reactor containment vessel response to transient pressures and shock loading.

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About the Reviewer: Fred Albaugh, Fellow of the ANS, received his Ph.D. in chemistry from the University of Michigan. He worked on the Manhattan District plutonium chemistry program during the war; since 1947 he has been with the General Electric Company at Hanford.

At Hanford he has been involved in research and development on chemical processing, reactor technology and materials technology. He is presently Manager of the Reactor and Fuels Laboratory.

Operating Experience with Power Reactors.

Proceedings of a conference in Vienna in June 1963; International Atomic Energy Agency, Vienna, 1963. Two volumes, Volume I 526 pages, \$10.00, Volume II 412 pages, \$8.50. International Publications, Inc., 317 East 34th Street, New York, N.Y. 10016.

The purpose of the conference and a description of the material presented are summarized by the Foreword.

FOREWORD

"At the beginning of 1963 nuclear power plants produced some 3,500,000 kW of electrical power to different distribution grids around the world. Much significant operating experience has been gained with these reactors, but this experience is often not collected in such a way as to make it easily available.

"The International Atomic Energy Agency convened a Conference on Operating Experience with Power Reactors in Vienna from 4 - 8 June 1963 which was attended by 240 participants representing 27 of the Agency's Member States and six international organizations. At the Conference, 42 papers giving detailed experience with more than 20 nuclear power stations were discussed. Although similar meetings on a national or regional scale have been held earlier in various countries, this is the first arranged by the Agency on a world-wide basis. Some of the detailed material may have been given earlier but for the most part it represents new and recently acquired experience, and for the first time it has been possible to compile in one place such extensive material on the operating experience with power reactors.

"The Conference discussed the experience gained both generally in the context of national and international nuclear power development programmes, and more specifically in the detailed operating experience with different power reactor stations. In addition, various plant components, fuel cycles, staffing of nuclear plants and licensing of such staff were treated.

"It is hoped that these Proceedings will be of interest not only to nuclear plant designers and operators who daily encounter problems similar to those discussed by the Conference, but also to those guiding the planning and implementation of power development programmes."

This reviewer believes that the hope expressed in the last paragraph of the Foreword has been met. The compilation of actual operating experience contained in these volumes has already been