BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Irradiation Effects on Structural Alloys for Nuclear Reactor Applications

Editor	A. L. Bement (Symposium Chairman)
Publisher	American Society for Testing and Materials (1970)
Pages	563
Price	$49.25
Reviewer	John O. Schiffgens

This is a compilation of papers presented at the ASTM sponsored 1970 Symposium on Radiation Effects on Structural Metals. "The primary objective of the symposium was to provide a comprehensive review of current technology in the development and evaluation of metallic materials for thermal and fast nuclear reactors." This international gathering of researchers took place in Canada. Of the 27 contributors, approximately 60% were from the United States, with the remainder from Canada, the United Kingdom, Japan, Italy, Germany, and Yugoslavia.

The papers selected by the symposium committee were arranged for presentation into six sessions. Three sessions were devoted to various aspects of fast reactor materials (Damage Mechanisms, Swelling Behavior, Properties), two sessions dealt with pressure vessel steels (Fracture Behavior, Structural and Impurity Effects), and one session treated thermal reactor materials. Among the presentations there are numerous noteworthy contributions. One of these, by J. R. Hawthorne, "Demonstration of Improved Radiation Embrittlement Resistance of A533B Steel Through Control of Selected Residual Elements," describes succinctly the highly detrimental influence of copper on the radiation embrittlement resistance of A533B steel. Although there is no speculation as to possible mechanisms the significance of the findings with regard to plate and weld metal specifications is emphasized. The paper by R. Bullough and R. C. Perrin, "The Mechanisms and Kinetics of Void Growth During Neutron Irradiation," reflects the current status of fast neutron irradiation swelling models and provides some insight into the difficulties associated with a theoretical analysis of this problem. D. W. Keefer and co-workers at Atomics International present the interesting results of research concerned with "Void Formation in Proton Irradiated Stainless Steel." Not only are their transmission electron micrographs remarkably similar to those resulting from fast neutron bombardment, but hydrogen appeared not to influence void nucleation. The latter suggests that, at least at this point in time, it is reasonable to neglect (n, p) reactions in the analysis of swelling. The research by K. Ehrlich, H. Böhm, and C. Wassilew, "Influence of Neutron Irradiation on the Creep Rupture Properties of a 16 Cr-13 Ni Steel," clearly demonstrates the extent to which pretreatment can affect the time to rupture and the strain to fracture of steel.

It should not be inferred that the above mentioned papers are the only ones of merit. Rather, they are representative of the broad scope and overall high quality of the symposium. As to be expected, the level and manner of presentation are such that this volume is obviously directed to researchers in the field of radiation effects. While there is information of interest to the design engineer, it is not conveniently presented for his use. It might be desirable for future symposia of this kind to actually incorporate a special session attended by designers, engineers, and materials scientists for the purpose of facilitating the exchange of information and discussing the "design and development implications of recent findings."

The volume is well organized and for the most part the articles are quite readable. The discussions following each paper left a little to be desired. These should have been such as to direct attention to—and provide additional insight into—the most pertinent aspects of the research reported. In most cases they did neither. However, in spite of the recognized difficulties and occasional disappointments associated with the development of good dialogue for publication, the effort is commendable and should be continued.

Anyone doing research in the field of irradiation effects on structural alloys should have ready access to this volume.

J. O. Schiffgens is an assistant professor in Nuclear Engineering at Purdue University. He has received a BA from St. Vincent College, a BS from the University of Notre Dame, and both a MS and, in 1968, a PhD

from the Pennsylvania State University. He is currently active in researching crystal defect interaction mechanisms and modeling irradiation effects in non-fuel metals and alloys.

AN-34 Experiments in Nuclear Science

Author	Staff, ORTEC, Inc.
Publisher	ORTEC, Inc., 203 Midland Road, Oak Ridge, Tennessee 37830 (1971)
Pages	129
Price	$10.00
Reviewer	Wallace H. Fuller

Reviewing the publication, *AN-34, Experiments in Nuclear Science*, has been a pleasant experience. The manual is well written and organized in a fashion which facilitates both the comprehension and fulfillment of the experimental objectives. Sufficient references are also given to permit the student to obtain a more comprehensive treatment of the theory.

There is, however, no treatment of the phenomena of radioactive equilibria. Although half-life determination is given in this manual, the equilibria phenomena, which are a direct result of the half-lives of both parent and daughter nuclides, are not considered. Most lab manuals treat parent-daughter equilibria in some manner. For this reason, I believe at least a mention of this phenomena should be included if the inclusion of another experiment is not possible. Inexpensive minigenerators are available from the Educational Aids Department of the Union Carbide Corporation, Tuxedo, New York, which are specifically designed for the experimental observation of radioactive equilibria.

I feel sure that this publication will be useful for students as well as faculty and is an important addition to the radioisotope research and teaching programs.

Wallace H. Fuller (BS, MS, soil chemistry, Washington State University, 1938 and 1939; PhD, soil chemistry and soil microbiology, 1942) was a research associate, Department of Agronomy, Iowa State University from 1940-45; biochemist and soil scientist, U. S. Department of Agriculture, Agricultural Research Service, 1945-48; associate professor and associate biochemist, University of Arizona, 1948-56; professor, biochemist and head of agricultural soils, 1956 to date. Professor Fuller's interests and areas of research have included many articles and papers on radioisotope fallout and instruction of advanced graduate course in radiotracer techniques. He has been a continuous researcher with radioisotopes since 1945.

Nuclear Data for Reactors

Conference Proceedings, Helsinki, 2nd International Conference on Nuclear Data for Reactors, June 15-19, 1970. Vols. 1 and 2

Editors	IAEA
Publishers	Unipub, Inc. (1970)
Pages	Vol. 1, 741 Vol. 2, 958
Price	Vol. 1, $21.00 Vol. 2, $24.00
Reviewer	David Okrent

These two volumes comprise the Proceedings, including over 100 papers and discussions, of the Second International Conference on Nuclear Data for Reactors held in Helsinki on June 15-19, 1970. The first conference held by the International Atomic Energy Agency (IAEA) on this subject occurred in Paris in 1966. The scope and emphasis of this conference are well delineated by the section titles of the volumes:

- General Aspects of Needs and Uses for Nuclear Data
- Cross Sections and Techniques for High-Precision Neutron Nuclear Data Measurements
- Nuclear Data in the Thermal and Resonance Energy Region: $A > 220$
- Nuclear Data in the Thermal and Resonance Energy Region: $A < 220$
- Nuclear Data Above the Resonance Energy $A > 220$
- Nuclear Data Above the Resonance Energy $A < 220$
- Relationships of Microscopic and Integral Data
- Evaluation Problems and Methods.

The bulk of the papers and all of the discussion are in English; however, a considerable number of papers are in Russian or French, except for brief English abstracts. The major emphasis is on data of interest to fast reactors.

This conference represents an important landmark in the nuclear data aspects of reactor physics, and the proceedings are in the excellent tradition of IAEA conferences, including major technical contributions from throughout the world of nuclear reactors. There is very good balance between review papers and new contributions.

The review papers in the opening session deal with the cross-section needs for fission reactors, fusion reactors, and astrophysics, and include a report on the current status of theoretical understanding of neutron cross sections. Each of the succeeding sessions also includes one or two review papers, and most of the contributed papers carefully presented new data in the context of existing information, so that the reader is provided with perspective.

Because of the current world-wide emphasis on fast reactor development, major attention in both data measurement and evaluation is given to fast neutron fission in ^{235}U and ^{239}Pu, capture in ^{239}Pu and ^{238}U, and inelastic scattering in ^{238}U, as well as the absolute value and energy dependence of ν and the resonance structure of the actinides.

Relatively good agreement on higher values of alpha = $\sigma_{capture}/\sigma_{fission}$ for ^{239}Pu in the energy range 100 eV to 20 keV has now been obtained. On the other hand, despite extensive and careful work by several capable experimental groups, surprisingly large discrepancies continue to exist in the basic fission cross section for ^{235}U, relative to which most other fast fission cross sections are measured, and in the n,γ cross section for ^{238}U, which is very significant to criticality and reactivity prediction for large fast reactors. The difficulties of obtaining accurate absolute measurements, the interplay of factors involved in