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Book Reviews

Uranium and Graphite, Proceedings of a Symposium held in London, 20–21 March, 1962, No. 27. The Institute of Metals, 17 Belgrave Square, London, S.W.1. England, 99 pp., 1962, 50s.

There is some question concerning the use of the term symposium with respect to this book. In essence it is divided into eight unrelated articles dealing with uranium and five articles pertaining to graphite.

A few general comments can be made. All papers were authored by people from Great Britain so the contents tend to be oriented along specific lines in both research and technology. It is rather surprising that this emphasis extended into the references cited. Conceivably the publication dates served as a limitation, but one would expect to find some of the relevant work from the United States quoted covering the period 1959–1961. Certainly, there were several articles from the United States during this period that are immediately applicable.

The papers tend to be refinements of previous work rather than presentation of new concepts. As such they should appeal more to the experts in the field who are looking for additional data, rather than the person desiring a broad and general acquaintance with one or both of the fields of graphite and uranium. Finally, the quality of the papers is somewhat uneven. There are some excellent articles representing definite advances in the fields of uranium and graphite. Also, there are some papers of a quasi-review nature that make no particular contribution.

The papers dealing with uranium cover grain size and preferred orientation, a study of the beta to alpha phase change, effects of neutron irradiation and thermal cycling on deformation under load, isothermal and thermal cyclic creep of alpha uranium, oxidation in carbon dioxide and carbon monoxide between 200 and 500°C, irradiation growth relationships in mono- and poly-crystalline uranium, electron microscopy studies of irradiation damage, and the swelling in alpha-uranium irradiated to 0.7% burnup.

The graphite papers cover pore properties, control of anisotropy, irradiation-induced dimensional effects, creep under irradiation, and the influence of lattice defects on physical properties.

Those concerned with the deformation of metallic uranium during irradiation will find the elegant extension of Cottrell's original creep theory of some interest. The fuels engineer who requires creep data on uranium should find the parametric plots for isothermal and thermal cycling creep invaluable. These data represent a major share of the available information.

A substantial insight into the mechanisms of dimensional instability and swelling of uranium can be gained from the papers of Buckley, Makin *et al.*, and Bellamy. The work of Bellamy is of major interest in that it defines compositional variables that markedly inhibit the swelling of uranium during irradiation. Since swelling has limited the use of uranium at higher temperatures, the approach suggested by Bellamy may extend the useful range of uranium in temperature and/or burnup.

Two of the papers on graphite deal with manufacturing variables controlling porosity and anistropy and the significance of porosity and anisotropy on the physical properties of graphite. As such they will interest users of nuclear graphites. Williamson's paper relating lattice defects to physical properties does an excellent job of relating such defects as vacancies and dislocations observed by transmission of electron microscopy to the stress/strain behavior in graphite.

One cannot quarrel with the price of this book (50s), but it will probably appeal to a rather limited audience in this country because of its specific nature, and because it is oriented to British reactor technology, like all such books it is partially obsolete by the time it is published, and in the case of the graphite work, the new book "Nuclear Graphite" covers similar ground in greater detail.

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(About the Reviewer: Spencer Bush has worked in the fields of nuclear materials for more than ten years. He holds degrees in Chemical and Metallurgical Engineering from the University of Michigan, including his doctorate in Metallurgical Engineering in 1953. Since then he has worked for General Electric Company at the Hanford Atomic Products Operation. During this period he has been Supervisor of Physical Metallurgy, Supervisor of Fuels Fabrication Development and a Metallurgical Specialist. Currently he is a Consulting Metallurgist in the Reactor and Fuels Laboratory, Hanford Laboratories.)

Reactor Handbook, Vol. III, Part B. Shielding, 2nd ed. Interscience, New York, 287 pp., 1962, $10.00.

This is the second edition of a handbook first published in unclassified form in 1955; it is natural, therefore, to begin by comparing it with the first edition. Although the page size and the broad outlines of the contents remain unaltered, it may be remarked that the amount of subject material has been increased by nearly fourfold with a corresponding increase in the number of authors from 8 to 18. The description of "second edition, revised and enlarged" is, therefore, modest in the extreme; this is virtually a completely new book.

The volume begins with a short chapter describing the basic problems of shielding. The hazards of reactor radiation are described, radiation dose rates are defined, a brief outline of the necessary steps in shield design is given, and the chapter is closed with a description of some reactors