be helpful to trainees in radiotherapy. The material is clearly presented and covers the subject rather completely. The charts are very clear and easy to use. Almost all the charts are based on dose distribution from ^{60}Co, but the effects of radiations of other qualities are also discussed, and several charts at the end of the volume consider the effects of various megavoltage x rays on the resulting patterns of dose distribution.

This volume is highly recommended as a reference source and teaching manual for every radiotherapy department.

Harold Atkins is a member of the staff of the Medical Department at Brookhaven National Laboratory, where, since 1963, he has specialized in neutron radiography, neutron-capture therapy, and the development of scanning techniques for mapping in vivo *radioisotope distributions. He received his radiology training at the hospital of the University of Pennsylvania and practiced radiotherapy and nuclear medicine at Yale University School of Medicine and at Columbia University College of Physicians and Surgeons. His MD degree (1952) is from Harvard Medical School.*

RECOMMENDED FOR NONSPECIALISTS

Title Handbook of X-Rays

Editor Emmett F. Kaelble

Publisher McGraw-Hill Book Company, 1967

Pages x + 1028

Price $35.00

Reviewer Benjamin Post

In recent years, the rapid growth of interest in x-ray diffraction and related techniques has been accompanied by a corresponding increase in the number of texts that deal with a wide variety of subjects in this general area. These volumes are designed primarily to meet the needs of specialists. Unfortunately, little attention has been paid to the requirements of nonspecialists, of chemists, physicists, or metallurgists, who wish to use x-ray methods as an auxiliary tool in their work and who also wish to understand what they are doing. It is this latter audience at which the *Handbook of X-Rays*, edited by Kaelbe, is aimed.

An impressively wide range of topics is covered in 48 chapters written by specialists in various fields. Clearly, where so many authors are involved, it is inevitable that the level of treatment will vary. In general it appears to be good, and in many instances it is excellent.

The *Handbook of X-Rays* brings together in one convenient volume a mass of information about scientific areas where x-ray techniques are used. This information is generally not available to the nonspecialist or could be made available only after very long and tedious search through the literature. The book is divided into six parts. Part 1 deals with what are designated as "Fundamentals."

Part 2 deals with "Diffraction of X-Rays by Polycrystalline and Amorphous Materials." This is by far the largest section in the volume and includes 17 chapters covering a wide variety of topics related to powder diffraction methods

In Part 3, "Determination of Crystal Structure," the editor appears to have a peculiar understanding of what constitutes "determination of crystal structure." For example, the inclusion of Chapter 28, entitled "Indexing of Powder Patterns," in this part appears to be stretching the meaning of plain words a good deal. It clearly belongs in Part 2 and its inclusion in Part 3 appears to reflect an unfortunate attitude of the editor toward crystal structure analysis.

Parts 4, 5, and 6 deal with "X-Ray Emission Spectroscopy," "X-Ray Absorption Methods," and "Microradiography and X-Ray Microscopy." Most attention is paid, as might be expected, to emission methods. The treatment of fluorescence analysis techniques appears to be adequate.

One important omission does characterize the entire volume. In the past ten years, theoretical and practical interest in methods of investigating crystal perfection by x-ray diffraction techniques, lumped together in the broad category of "x-ray topography," has grown to the point where at the present time there are probably as many investigators working in this area as in any other branch of the field. Yet nowhere in this handbook is there any serious discussion of crystal perfection studies by x rays. This oversight represents a serious shortcoming in the volume. Nevertheless, I recommend the volume highly, particularly to nonspecialists working with x rays.

Benjamin Post (PhD, Chemistry, Polytechnic Institute of Brooklyn, 1949) is a Professor in the Department of Physics at Brooklyn Polytech. Among his many research interests are chemical crystallography, low temperature x-ray diffraction, lattice vibrations, crystal structure analysis, and ultra high pressure methods. He was president of the American Crystallographic Association in 1966.

WASTE TREATMENT TREATED

Title Treatment of Low- and Intermediate-Level Radioactive Waste Concentrates

Publisher International Atomic Energy Agency, 1968

Pages 110

Price U.S. $2.50

Reviewer Lee Gemmell

The general subject of treatment of radioactive waste concentrates had been discussed briefly at two symposiums sponsored by the IAEA in 1959 and 1965. To give an opportunity for further international discussion, the Agency convened a panel of thirteen experts from eight countries. The panel studied the problem in depth by reviewing operating practices and experiences and developing cost data on typical operations in various countries. The resulting document is an interesting recital of the methods used by many atomic energy sites in various parts of the world for handling and processing their low- and intermediate-level radioactive wastes.

In general, the sites have tended to develop their own special methods for waste disposal, frequently depending on local restrictions and conditions and the economic advantages of one method over another. Since the cost of disposing of radioactive waste is relatively high, all sites have their eyes on ways to cut costs. Some sites in heavily populated areas may have severe public relations problems that will not permit local disposal of any radionuclides; other facilities may be able to use their favorable location to a great advantage. For example, at Lucas Heights, Australia, where the sun shines most of the year, solar evaporation has proved to be very effective and economical in reducing the volume of radioactive liquids. Other methods discussed in this publication are: first- and second-stage evaporators; natural, pressure, and vacuum filtration; centrifugation; and trapping in bitumen or vermiculite and cement.

I recommend this document to those who are not familiar with present practices of low- and intermediate-level waste disposal at the many representative atomic energy laboratories and plants. Others who are responsible for waste disposal may find many of the ideas interesting and helpful in improving their own present methods and procedures. I think the panel is to be congratulated for bringing together the experiences of such a wide variety of sites in this rather under-published technical field.

Lee Gemmell, Associate Head of the Health Physics Division at Brookhaven National Laboratory and a certified Health Physicist, has been closely associated for almost 20 years with the Radioactive Waste Disposal Program. The BNL policy of disposing of only very low levels of radioactivity into the environment has been effective, by example, in promoting international restraint against indiscriminate disposal of radionuclides into local soil or waters. Through his efforts, Brookhaven has also been active in developing improved methods of treating, packaging, and shipping low and intermediate levels of radioactive wastes before final disposal at an approved burial site.

EXCELLENT, BUT DATED

Title The Effects of Radiation on Structural Materials

Symposium Chairman W. L. R. Rice

Publisher American Society for Testing and Materials, 1967

Pages vi + 713

Price $52.00

Reviewer J. J. Holmes

This volume, a collection of research papers, is concerned with neutron irradiation effects on the mechanical properties of metals and alloys. In general, the papers deal with alloys of importance in nuclear reactor applications. However, 2 of the 29 papers deal with irradiation effects in relatively pure iron. The subject matter spans a wide range of subjects including pressure vessel steels, austenitic stainless steels, refractory metals, irradiation damage mechanisms, heat treatment effects, and cryogenic effects. Mechanical properties discussed include brittle fracture, tensile, creep, and fatigue. Considerable emphasis is also given to correlation of microstructure with properties.

This collection is the record of the third in a series of biannual international symposiums sponsored jointly by the USAEC and ASTM. Papers from nearly every USAEC-sponsored laboratory dealing with irradiation effects in structural and cladding metals are present, together with a considerable contribution from the United Kingdom. Papers from Sweden, West Germany, and Italy are also included.

The caliber of research involved in the contributions is excellent with few exceptions. The subject matter will find greatest use among researchers in the field. However, much emphasis is placed on engineering applications, so the book will also be useful as a guide to reactor designers and engineers. It should be pointed out that the applications discussed deal with trends in irradiation effects rather than with specific design guides.

As a reference for researchers, the book's value has been severely reduced by the long delay between the call for papers and their publication; this being in excess of two years. In a rapidly moving technology, some of the work has become outdated. In addition, the book was almost too late to be useful as a reference source for the fourth biannual USAEC-ASTM symposium on radiation effects.

One apparent weakness of the collection is poor organization. In passing through the volume in sequence, one finds no relationship between the subject matter of the papers. It would seem that the volume could be reasonably divided into three major areas, namely, pressure vessel steels, stainless steels and nickel base alloys, and miscellaneous subjects which are not closely related. The lack of good organization may lead the uninitiated to the conclusion that there is only a casual relationship among the subject matter of the various papers.

An objective of the symposium was to complement the AIME radiation effects symposium held in Ashville in 1965. The Ashville conference was intended to "assess the degree of agreement between theory and experiment" while the purpose of this USAEC-ASTM symposium was to "show how selected properties . . . change as a function of reactor environment and exposure." This reviewer found only one reference to the Ashville conference in the entire book and this by an author referencing his own work. Thus, it would appear that in the sense of being complementary to the Ashville conference, this book has not fullfiled its objectives.

Probably the greatest contribution provided by this volume is an easily available and complete reference on research in nuclear structural and cladding materials as of 1966.

Mr. Holmes, a Senior Research Engineer at Battelle-Northwest, received his BS in metallurgy in 1959 from the University of California and MS in metallurgy from the University of Washington in 1964. He was associated with the General Electric Company and Atomics International before joining Battelle in 1966. He has made contributions to the literature in the areas of in-reactor creep, dislocation dynamics, and irradiation effects. Currently, he is engaged in research on fast reactor materials.