

Introduction

The 1970 Symposium on Radiation Effects on Structural Metals was the fifth in a series of related international conferences that have been held biennially. The symposium, sponsored by ASTM Committee E-10 on Radiosotopes and Radiation Effects, had the primary objective of providing a comprehensive review of current technology in the development and evaluation of metallic materials for thermal and fast nuclear reactors. This was accomplished by bringing together the world's experts in nuclear radiation effects on structural metals, utilizing as a focal point a selected group of papers and providing a forum for discussion of new techniques for applying structural metals to various nuclear environments.

This is an expanding field of technology of vital interest to research and development investigators, reactor design, nuclear utilities, the nuclear industry, and government. While efforts to minimize the detrimental aspects of radiation induced property changes in thermal reactor materials are continuing, the development of superior materials that will withstand void swelling in fast breeder reactors is presently the focus of technological effort. Furthermore, experimental and analytical methods for correlating property changes with neutron flux and energy parameters have achieved a promising stage of development. In order to cover the important aspects of the general topic, approximately forty papers contributed by recognized experts from many countries were carefully selected by the symposium committee and were arranged into six sessions. This volume is accordingly divided by session topic to facilitate the reader's review in terms of his preferred interest. The topics include (1) pressure vessel steels—fracture behavior, (2) pressure vessel steels—structural and impurity effects, (3) thermal reactor materials, (4) fast reactor materials—damage mechanisms, (5) fast reactor materials—swelling behavior, and (6) fast reactor materials—properties. Recent advances in neutron dosimetry for thermal and fast reactor applications were reviewed in three invited papers, two of which are included in the proceedings; namely, "Neutron Dosimetry for Reactor Pressure Vessel Applications," by C. Z. Serpan, Jr., and W. C. Morgan and "Neutron Dosimetry for Fast Reactor Applications," by W. N. McElroy and R. E. Dahl, Jr.

Two agenda discussion sessions stimulated plenary discussions of subjects of technical interest. Scientists eminent in the field were selected as

discussion leaders and were given the responsibility for outlining critical points and developing the discussion of each point. These leaders were assisted by rapporteurs who prepared a more or less literal transcription of the discussion. The two sessions were "Structural and Composition Effects on Irradiation Sensitivity of Pressure Vessel Steels," L. E. Steele, chairman, and C. W. Hunter, rapporteur, and "How Do We Solve the Void Problem?" K. Zwilsky, chairman, and T. T. Claudson, rapporteur. The agenda discussion chairmen have condensed, rearranged, organized, added commentary to, and interpreted these discussions, each at his own discretion, in order to contribute a compendium of current thought on each topic. These agenda discussions are included in these proceedings following the formal papers to which they refer. In addition, a rapporteur session, "Swelling of Austenitic Stainless Steels in Fast Reactors—Experimental Evidence and Design Considerations," was presented by J. R. Weir but is not included in this publication.

Scheduling this symposium in Canada not only enhanced the international focus on the symposium topic but also attracted a broader international representation. In addition to the host country, Canada, authors and attendees from Australia, Belgium, Czechoslovakia, France, Germany, India, Italy, Japan, the Netherlands, the United Kingdom, the United States, and Yugoslavia discussed recent work being conducted in their homelands.

Rapid advances in nuclear materials technology along several fronts were evident from this symposium. They suggest the importance of both these proceedings and future symposia to the further development of an international exchange of information encouraged by this and preceding symposia of this series. The authors and discussers are commended for their excellent presentation of both the problems and some solutions in the field of nuclear radiation damage of materials.

The members of the symposium committee were Arden L. Bement, chairman, John Moteff, cochairman, Klaus Zwilsky, Charles J. Baroch, E. Landerman, and Lendell E. Steele. The symposium committee gratefully acknowledges the substantial assistance of Rebecca R. Martin, Pacific Northwest Laboratory, for secretarial services and of Duane N. Sunderman, chairman, ASTM Committee E-10, for his leadership and encouragement.

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