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Introduction

Attempts to miniaturize mechanical test specimens, particularly for testing irradiated materials, are certainly not new. Limited space in materials test reactors, concern about gamma heating or fluence gradients in large specimens, and dose to personnel in post-irradiation testing have all been motivations for reducing specimen size. In addition, limited material availability or test machine capacity (e.g., in the case of fracture toughness testing) and microstructural gradients in thick sections have historically provided impetus for reducing specimen size in testing materials in general. However, recent efforts to develop materials for nuclear *fusion* reactors have provided a much increased interest in scaling down mechanical test specimen sizes.

The current fusion reactor materials development program, both in the United States and worldwide, is hampered by the lack of a prototypic irradiation environment in which to test candidate materials. This necessitates a development program with the following characteristics: (1) heavy reliance on fission-reactor-based irradiation data, (2) development of a correlation methodology based on a fundamental understanding of radiation damage and resulting property changes, (3) extrapolation of the correlation methodology to the fusion regime, and (4) verification of extrapolated predictions by comparison with 14 MeV neutron irradiation data. To accomplish this last step in the near future will require reliance on accelerator-based high energy neutron sources which are quite limited in irradiation volume. This in turn absolutely requires the use of low-volume specimens and the development of corresponding techniques to extract useful properties from such specimens.

Consequently, a number of programs have been engaged in developing such techniques. Indeed, rapid progress has been made on a host of techniques providing a wide range of measured properties, and interest in these techniques has become relatively widespread. As a result, concern has arisen that techniques might be developed and applied without adequate coordination among users, leading to unnecessary confusion, erroneous data, and duplication of effort. A task group was thus formed under the auspices of ASTM Subcommittee E10.02 on Behavior and Use of Metallic Materials in Nuclear Systems to consider whether a set of recommended practices for individual small-specimen techniques might be useful and, if so, to write such practices.

One of the first decisions of the task group was that the time was appropriate to hold a symposium on small-specimen testing. It was felt that this would serve as an initial milestone in the development of these tests, and that the resulting publication could be used to help address questions concerning recommended practices. As members of this task group, we agreed to organize such a symposium and to edit the contributed papers. The symposium was held in Albuquerque, New Mexico, on 23 September 1983 and consisted of parallel morning and afternoon sessions. Full-length papers were submitted following the symposium and were thoroughly reviewed. The papers contained in this publication represent the culmination of this effort. It is our hope and belief that these papers will be of significant use in advancing the technology of small-specimen testing.

W. R. Corwin

Metallurgical Engineer, Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; symposium chairman and editor

G. E. Lucas

Associate Professor, Department of Chemical and Nuclear Engineering, University of California, Santa Barbara, California; symposium chairman and editor