Development of microscale testing methods for assessing radiation damage in metals

L.N. Brewer, B.L. Boyce, J.R. Michael, K.M. Hattar

Sandia National Laboratories, Albuquerque, New Mexico, U.S.A.

J.C. Zhao

The Ohio State University

Columbus, OH

This paper describes efforts to develop microscale methods for testing of radiation damaged metals. The objective of this program is to simulate fast neutron damage in cladding steels using high energy, heavy ions. While these ion beams can create large levels of radiation damage, e.g. 100 displacements per atom, they do so over a limited depth from the surface of the sample, on the order of several microns.

Our work combines heavy ion irradiation with *ex situ* and *in situ* experiments to test the effects of irradiation damage on the mechanical properties, the swelling, and the thermal properties of metals from microscale volumes. We use the micropillar compression geometry for measuring the stress strain curve of irradiated metals. We will discuss intial results on the *in situ* measurement of swelling using an SEM coupled to the ion beam accelerator. Finally, we will discuss our work to do microscale measurements of thermal properties such as thermal conductivity and expansion. It is our goal to combine these measurements with simulations of the same properties in metals.

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