Bridging the Length Scales on Mechanical Properties of Irradiated Materials

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Abstract

Extracting mechanical property values from small sample volumes has tremendous benefits for nuclear materials evaluations. Reducing materials hazardous levels by reducing the sample volume, making ion beam irradiations accessible to mechanical properties or simply sample regions of specific interest are features one can take advantage of if SSMT is deployed. However, the values measured at small length scales are not the same as values measured at large length scales. Fundamental material science and some knowledge on the materials microstructure must be deployed to understand this translation between the scales. Further new infrastructure and technology today allows for a more rapid sample manufacturing allowing to probe the multiple length scales fast and efficient.

This presentation will outline the scientific reasons for scaling effects associated with different testing techniques as well as mitigation strategies so one can quantify property changes due to radiation at multiple length scales. Data on ion beam irradiated materials as well as neutron irradiated materials are presented while a new technique for sample manufacturing is introduced.