

Tutorial on

Ion Irradiation as a Predictive Tool for Neutron Irradiation Effects

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Qualification of materials is the biggest challenge for deployment of both fission and fusion reactor designs. Obstacles include a lack of a fusion neutron source, fission test reactor availability, and the amount of time it takes to obtain the required data. Ion irradiation in combination with advanced characterization and predictive modeling has evolved and had been benchmarked against test reactor data to establish the technique as a viable means of obtaining both microstructure and mechanical properties data that accurately represent that generated with neutron irradiation. This tutorial will cover proper techniques for conducting ion irradiation, strategies to produce microstructures and mechanical properties, and to develop predictive models that match those produced by neutron irradiation. Examples from various ion irradiation strategies and alloy systems, the roles of transmutation products in the evolution of material properties during irradiation, and strategies for achieving multiple irradiation conditions with a single irradiation will be provided.