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# An Investigation into Plastic Deformation of Irradiated Tungsten Microstructure at Elevated Temperatures using the Anand's Viscoplastic Model

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**ABSTRACT**

Tensile deformation of a tungsten (W) microstructure is examined at elevated temperatures and at varying levels of irradiation. The computational framework used in this study is based on the finite element (FE) method using the Anand viscoplastic model. In order to account for viscoplasticity at high temperatures, the relevant material parameters of the Anand viscoplastic model have been determined through uniaxial tests upon W samples containing a high level of neutron irradiation. Analyses show that the effect of thermal softening decreases with increase in irradiation dose. In addition, a sigmoidal dependence of irradiation dose on the yield strength of W microstructures is observed. The FE analyses also suggest that the yield strength of W is directly correlated with temperature and irradiation dose. Based on the simulation results, an empirical relation for predicting the yield strength of W is proposed based upon the temperature and irradiation dose. The developed relation is found to predict the yield strength of W well over a wide range of temperatures and irradiation doses.

**Keywords**: Irradiation, B. Polycrystalline material, B. Viscoplastic material, A. Thermomechanical processes, C. Finite elements