Irradiation Driven Diffusion in UMo Fuels

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A monolithic fuel design based on a U-Mo alloy has been selected as the fuel type for conversion of the United States High-Performance Research Reactors (HPRRs). An issue with U-Mo monolithic fuel is the large amount of swelling that takes place during operation. The accurate prediction of fuel evolution under irradiation requires implementation of correct thermodynamic properties into mesoscale and continuum level fuel performance modeling codes. Due to the low operational temperature of these fuels, it is expected that irradiation driven diffusion significantly contributes to species, and in particular fission gas, motion, clustering and resolution. However, no such studies have been performed to elucidate irradiation effect on diffusion or how that diffusion compares with thermal or defect-cluster enhanced diffusion. In this work, irradiation driven diffusion is investigated from 100 K to 500 K in U-Mo alloys from 7 weight percent Mo up to 15 weight percent Mo. This diffusion coefficient is compared to and incorporated into the thermal diffusion information for a more complete description of U, Mo and Xe diffusive behavior under operation.