

Investigation of restructuring behavior in commercial LWR fuel

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Urania fuel used in light water reactor undergoes extensive restructuring during service. The change in fuel microstructure impacts the mechanical properties, thermophysical properties, and fission gas retention behavior, among other critical performance metrics. Understanding the evolution of the fuel microstructure is critical to developing effective fuel performance models and optimizing reactor operation. Irradiated fuel metallographic cross-sections from rods discharged from the Limerick and North Anna Generating Stations have been prepared at ORNL hot-cell facilities. These cross-sections have been subjected to electron backscatter diffraction (EBSD) across the fuel radius to connect fuel performance (radial variation in burnup, temperature, etc.) to local microstructural evolution. Results will focus on the variation of grain boundary character distribution and grain size variation across the radius. The results will inform on the responsible mechanisms for restructuring with a particular focus on the formation of the “high burnup structure”.