Three-Dimensional Microstructural Characterization of the Peripheral Region in FBR MOX Fuel

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In fast breeder reactor (FBR) (U,Pu)O_2 mixed oxide (MOX) fuels, microstructural changes occur early on in the fuel's life cycle with the production of fission products. As these products agglomerate, new phases and precipitates form that can have different, undesirable properties compared to the bulk of the fuel. Understanding the effect and evolution of these products is critical when striving to optimize reactor safety and performance. In this study, focused ion beam (FIB) tomography was utilized to serially section a segment from the peripheral region of FBR MOX fuel irradiated in the Fast Flux Test Facility (FFTF) to a burn-up of 13.7% fissions per initial metal atom (FIMA). The process was performed in conjunction with electron backscatter diffraction (EBSD) and energy dispersive X-ray spectroscopy (EDS) so that a detailed reconstruction of the three-dimensional (3D) pore, fission product, and grain structure could be built. The results of this investigation will present microstructural relationships between grain orientations, grain boundaries, porosity, and fission products in the peripheral region of FBR MOX fuel.