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Microstructural Evolution of Monolithic Fuel Foils During Processing

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Residual stresses are expected in monolithic, aluminum clad uranium 10 weight percent molybdenum (U-10Mo) nuclear fuel plates because of the large mismatch in thermal expansion between the two bonded materials. Previous high energy x-ray diffraction measurements successfully profiled the residual stresses in the U-10Mo, but were unable to probe either the Al cladding or the 15micron Zr diffusion prevention barrier due to poor grain statistics. Neutron diffraction, with its inherently more divergent incident be alleviates this problem and, moreover, allowed for the determination of the dislocation density and texture in all three phases. Several samples were examined as a function of processing step and the phase stresses, dislocation density and texture are monitored with respect to the processing conditions.

Keywords: Nuclear Fuel, Residual Stress, Neutron Diffraction