UNIAXIAL TENSILE DEFORMATION OF URANIUM 6 WEIGHT PERCENT NIOBIUM; A NEUTRON DIFFRACTION STUDY OF DEFORMATION TWINNING.

D. W. Brown, M. A. M Bourke, P. S. Dunn, R. D. Field, M. G. Stout, D. J. Thoma
Material Science and Technology Division
Los Alamos National Laboratory, Los Alamos, NM, 87545

The deformation of polycrystalline uranium 6 wt. % niobium (U6Nb) was studied *in-situ* during uniaxial tensile loading by time-of-flight neutron diffraction. Diffraction patterns were recorded at incremental stresses to a maximum of 450 MPa (~ 4% macroscopic strain). Consistent with reorientation of the martensite variants by twinning, significant changes in the diffraction peak intensities which were proportional to the plastic contribution of the macroscopic strain were observed. Both the lattice parameters (**a**, **b**, **c**, and γ) and interplanar spacings (d_{hkl}) were determined as a function of applied stress. Phenomenologically, the highly anisotropic stress response of the lattice parameters as well as the individual lattice spacings can be related to deformation twinning. Preliminary transmission electron microscopy studies identified the $(\bar{1}30)$ and $(\bar{1}72)$ as active deformation twinning systems of U6Nb in tension.