DEFORMATION MECHANISMS IN 316 STAINLESS STEEL IRRADIATED AT 60 AND 330°C – N. Hashimoto, S. J. Zinkle, A. F. Rowcliffe, J. P. Robertson (Oak Ridge National Laboratory) and S. Jitsukawa (Japan Atomic Energy Research Institute)

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Plastically deformed microstructures in neutron-irradiated austenitic stainless steel were investigated by transmission electron microscopy (TEM). Neuron irradiation at 60 and 330°C to about 7 displacement per atom (dpa) induced a higher number density of faulted loops and black dots, which resulted in irradiation-induced hardening. In the specimen irradiated at 60°C and tensile tested at 25°C at a strain rate of 4×10^{-4} s^{-1}, the deformation microsctructure consisted of twins, elongated faulted loops, and lath and twin martensite phase. In the specimens irradiated and tested at 330°C at a strain rate of 4×10^{-4} s^{-1} and 4×10^{-6} s^{-1}, in addition to these features, dislocation channeling was also observed. The TEM examination suggests that lath and twin martensite can form during tensile testing at both of these temperatures. Examination of the specimens irradiated and tensile tested at 330°C indicated that twinning was the predominant deformation mode at slower strain rate and dislocation channeling was favored at higher temperature. From the micrographs taken from the {111} plane streak in a diffraction pattern, it is suggested that faulted loops could be the principal twin initiation site during deformation.