## Re-irradiation of Neutron Irradiated 304L Stainless Steel to High Damage Levels

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The goal of extending the damage level of neutron irradiated samples with ion irradiation is to predict the microstructure at higher damage levels a priori. The objective of this study is to determine whether self-ion irradiation of a neutron irradiated sample can reproduce the most important aspects of the irradiated microstructure at high dpa. Samples of a 304L stainless steel from a core shroud were previously irradiated in the BOR-60 reactor at 320°C at a dose rate of $9.4 \times 10^{-7}$ dpa/s (E > 0.1 MeV) to 5.5 dpa. They were then irradiated in the Michigan Ion Beam Laboratory to a terminal dose of 47.5 dpa with 9 MeV $Ni^{3+}$ ions at a dose rate of $\sim 10^{-3}$ dpa/s at 380°C, 400°C, and 420°C. Analysis of dislocation loops, precipitates, and radiation induced segregation (RIS) characterized by TEM and APT at each ion irradiation condition as well as the 47.5 dpa BOR-60 condition was completed. Ion irradiation at 380°C and 400°C produced loops and RIS comparable to the BOR-60 condition whereas at 420°C, loops were larger in diameter and grain boundary segregation was greater. For silicon-based clusters, ballistic dissolution impeded G-phase nucleation during ion irradiation at 380°C. At 400°C and 420°C, G-phase precipitates were observed, however they were larger in size, lower in density, and contained less manganese than in the BOR-60 condition. For copper-based clusters, ballistic dissolution was observed at all three ion irradiation temperatures even though clusters with ~50 at% Cu were present in the BOR-60 condition.