

RADIATION-INDUCED SEGREGATION IN 316 AND 304 STAINLESS STEEL IRRADIATED AT LOW DOSE RATE

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As part of the shutdown of the EBR-II reactor, structural materials were retrieved to analyze the effect of long term irradiation on mechanical properties and microstructure. In this work, the effect of low dose rate irradiation (10^{-7} to 10^{-8} dpa/s) on grain boundary composition in 316 and 304 stainless steels is analyzed. Samples were taken from reflector subassemblies irradiated in the reflector region of EBR-II irradiated at temperatures from 371-390°C to doses up to 30 dpa. The effects of dose, dose rate, and bulk composition on radiation-induced segregation are analyzed. In 304 stainless steel, decreasing the dose rate increases the amount of grain boundary segregation. For a dose of 20 dpa, chromium depletion and nickel enrichment are greater in 304 stainless steel than in 316 stainless steel. In 316 stainless steel, changes in grain boundary Cr and Ni concentrations occur faster than changes in iron and molybdenum concentrations. In both 304 and 316 stainless steels, the presence of a grain boundary precipitate significantly changes the grain boundary compositions in the vicinity of the precipitate.

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