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Effect of Irradiation Mode on the Microstructure of Self-Ion Irradiated Ferritic-Martensitic Alloys

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Abstract

The microstructures of ferritic-martensitic alloys HT9 and T91 were characterized following 5 MeV Fe^{++} ion irradiation to 140 displacements per atom (dpa) at 440°C with either a raster-scanned or defocused beam. Alloys were pre-implanted with 0-100 appm He and then subjected to either a raster-scanned beam or a defocused beam. Relative to the defocused beam, a raster-scanned beam suppressed microstructural evolution, evidenced by decreased diameter and number densities of voids, loop and precipitates, which lead to decreased void swelling, precipitate volume fraction and total dislocation loop line density. These results were consistent with the Fully Dynamic Rate Theory (FDRT) model which predicts that raster-scanning should lead to a decrease in defect population and suppression of nucleation and growth processes.

Keywords: Void Swelling; Ferritic-Martensitic alloys, Radiation effects; Raster-scanned, Defocused

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