Microstructure Evolution in Dual Ion-irradiated HT9 at 445 °C and 460 °C to 16.6 dpa

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Ferritic-martensitic stainless steel HT9 (Fe-12Cr-1Mo-MnWNiVSiC, wt. %) is of great interest in being applied in next generation nuclear reactors because of its superior swelling and creep resistance. Neutron irradiated HT9 shows distinct difference in hardening from 370 °C to 420 °C. To understand the microstructure evolution of HT9 near 400 °C with fine temperature change, dual ion irradiations, 2.1 MeV He^{2+}, followed by 5 MeV Fe^{2+} were performed on HT9 at 445 °C and 460 °C to 16.6 dpa at the depth of 0.6 μm. Transmission electron microscopy study revealed similar irradiation-induced microstructures at both temperatures, including dislocation loops, voids, G-phase precipitates, segregation of Ni and Si, and depletion of Cr at grain boundaries. Larger average void size and broader void size distribution are found at 460 °C than 445 °C. Preliminary result also suggests higher Ni and Si compositions at G phase at 460 °C than that of 445 °C.