Dislocation Loop Evolution in an Ion Irradiated FeCrAl Alloy with Various Irradiation Parameters

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Defect evolution in a Fe-$Cr_{12.5}$-$Al_{4.5}$ alloy has been studied using 6.0 MeV Au^{+} ions with various irradiation temperature (400-575°C), dose (up to 100 dpa at the peak) and 3 different dose rates. Cross-sectional transmission electron microscopy (XTEM) characterization has been conducted to study the defect distribution and dislocation loop formation. The size and density as well as depth distribution defect clusters resulted from different radiation conditions are compared. Preliminary results show that the formation conditions of two types of dislocation loops with Burgers vector of a <100> and a/2 <111> have a strong correlation with radiation temperature, dose and dose rate. a/2<111> dislocation loops become dominant with increased temperature, before they become open at even higher temperature. The dislocation loops become larger with increased irradiation temperature, damage dose and dose rate. Dislocation loops are observed to form in shallower depth from the surface with increased dose rate. No void swelling was observed until 100 dpa under all irradiation conditions.