Fe-Cr alloys are used as a model to study the microstructural evolution of defects in irradiated structural steel components of a fusion reactor. We use the potential developed by Caro et al [1] to carry out 25 keV displacement cascade simulations at room temperature in model single crystal Fe-Cr systems using large-scale molecular dynamics. This many-body potential incorporates the complex formation energy curve in the alloy, enabling it to correctly predict the order versus segregation tendency in the Fe-Cr system. Fe-Cr alloy compositions of interest lie between 8 and 20 atomic-% chromium. This range was chosen because both the atomistic model and experiments show precipitation of the alpha-prime phase in alloys at ~12 atomic-% Cr. We examine the effect of Cr concentration on the defect evolution, segregation behavior, and second phase precipitation in the early stages of damage. The irradiated Fe-Cr systems are compared with that of pure iron.


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