Cavity nucleation and growth during helium implantation and neutron irradiation of Fe and steel - DTU Orbit (25/12/2018)

The present work concerns investigations of damage accumulation during helium implantation of pure iron and the reduced activation ferritic-martensitic steel ‘EUROFER 97’ at 323K and 623K as well as during neutron irradiation with or without prior helium implantation. The defect microstructure, in particular the cavities, was characterized using Positron Annihilation Lifetime Spectroscopy (PALS) and Transmission Electron Microscopy (TEM). The PALS investigations reveal a clear difference between the He implantation effects in Fe and EUROFER 97 at both temperatures. For both materials the mean positron lifetime increases with He dose in the range 1 – 100 appm, although the increase is stronger for Fe than for EUROFER 97 and for both materials stronger for implantation at 323K than at 623K.

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