Effect of D on the evolution of displacement damage in W during annealing to 1000 K

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The effect of D on displacement damage annealing was studied [1]. Tungsten samples were irradiated with 20 MeV W ions at room temperature up to a dose of 0.23 dpa and loaded with low-energy D plasma at 370 K. Afterwards, samples were heated to a desired temperature (between 400 K and 1000 K) and kept at that temperature for two hours. The surviving displacement damage was decorated by re-exposing the samples to the same D plasma as before. The behaviour of displacement damage at different annealing temperatures was determined using Nuclear Reaction Analysis and Thermal Desorption Spectroscopy.

The experimental results showed the D to be predominantly released in two D desorption peaks, that behave independently at different annealing temperatures. The onset of defect evolution was found after annealing at temperatures above 500 K. We demonstrate that the presence of D has a negligible effect on defect behaviour by comparing our results to an experiment where a similar experimental procedure was used without D presence [2]. By using a macroscopic rate equation model we were able to replicate the experimental results, determining that there are three defect types present in the sample that are responsible for the majority of D retention.

[1] M. Pečovnik, et al. "Effect of D on the evolution of radiation damage in W during high temperature annealing," Nucl. Fusion 60, (2020) 106028.

[2] E. Markina, M. Mayer, A. Manhard, and T. Schwarz-Selinger, “Recovery temperatures of defects in tungsten created by self-implantation,” *J. Nucl. Mater.*463, (2015) 329–332.