Irradiation of tungsten by energetic helium: A molecular dynamics study

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Fuzz-like nanostructures are known to form on tungsten surfaces under helium irradiation in plasma installations. The appearance of such structures can rise the probability of unipolar arc ignition resulting in an enhanced surface erosion [1], which is extremely undesirable for future fusion devices. The formation of fuzz is well-studied in the case of low helium energies (20-100 eV) [2], whereas the growth regimes at higher energies ($>$ 100 eV) have yet to be investigated.

This work presents the molecular dynamics results on early stages of cumulative irradiation of (100) tungsten surface by helium with initial energies ranging from 100 to 500 eV. As a result, the dynamics of helium clustering is analysed and depth/size distributions of helium clusters/bubbles are obtained depending on the initial energy of incident atoms. Additionally, the probability of helium bubbles overheating due to the absorption of an energetic atom is discussed. The modelling was performed using the LAMMPS software package.

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