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Calculation of Radiation Damage for the Simulation of Neutron Radiation Damage by Ion Irradiation and Development AMTRACK Program

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Abstract

One of the most important results of neutron irradiation on targets is that atoms are displaced from their lattice sites after a nuclear reaction. The neutron irradiation damage is often simulated by using light/heavy ion irradiations, which prepare the flexible irradiation conditions. The knowledge of primary knock-on atoms (PKA) and point defect energy distribution is the first step to simulate radiation damage induced by neutrons and also, to calculate the amount of damage in “displacements per atom” (DPA) and damage profile in target. In this study, the MCNP code and SRIM code were used to simulate the interaction of neutrons and energetic ions with materials; then a new program was written by MATLAB software, AMTRACK, to analyze PKA and point defect specifications. Finally, the comparison of the fraction of recoils spectra as well as the weighted recoil spectra induced by ions/neutrons led to determining the best ions and their energy to simulate damage in reactors; our final goal was to predict the amount and profile of radiation damage by the best ion and neutron spectrum.

Keywords: radiation damage, defect production, primary recoil spectra, weighted recoil spectra, MCNP code, SRIM code, AMTRACK program

For full article, refer to the Persian section