

MCNP-4C2 and TRIM 98.01 based calculations of radiation damage in copper

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The work is focused towards the radiation damage of the first wall material of International Thermonuclear Experimental Reactor (ITER). There were performed Monte Carlo (MC) simulations by MCNP-4C2 and TRIM 98.01 codes to design the experimental part for Positron Annihilation Spectroscopy (PAS) measurements of neutron treated material of ITER first wall based on Cu-alloys. MC simulations by MCNP-4C2 code have been performed to determine the distribution of neutron fluence and primary-knock out- atoms (PKA) creation and to predict the probable activation of Cu sample. Considering our boundary conditions of the calculations, the helium production was $2.413\text{E-}03$ atoms/(source neutron·cm³), and the hydrogen production was $1.324\text{E-}02$ atoms/(source neutron·cm³). Calculated activity of the specimen is of about 20.5 MBq. The TRIM 98.01 code was used for the simulation of defects creation (vacancies, voids) in pure Cu by hydrogen H of 95 keV, only. The aim was to find out the distribution of protons in the defined depth. The main defects production was identified in the region of about 400-800 nm. Data obtained from computer simulations were compared with experimental data from PAS technique and are useful also for irradiation experiment preparing currently in FZ Rossendorf in the Technische Universität Dresden neutron laboratory.