

COPPER FRAGMENTATION IN NUCLEAR REACTIONS UNDER IMPACT OF HIGH ENERGY COSMIC PROTONS

Chechenin N.G., Chuvilskaya T.V., Kadenskii A.G., Shirokova A.A.
Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics, Russia
E-mail: chechenin@sinp.msu.ru

Copper fragmentation in nuclear reactions under impact of cosmic protons is considered. There is a trend of increase of relative copper concentration in modern integrated circuits (IC) with multilayered 3D architecture, where Cu is used as a main material component of inter-element contact paths, contact pads, interlayer contact vias. In contrast to the original space protons, the nuclear reactions fragments suffer much larger ionization losses, therefore can initiate a charge in a sensitive volume of the ICs exceeding the critical charge for generation of a false signal which can lead to malfunction of spacecraft on-board electronics. In the report the results will be presented of calculations, using TALYS code, of elastic and inelastic scattering cross-sections for protons with energies up to 200 MeV, isotopes and isobars yields of fragments, their energy, charge and mass distributions. The results demonstrate that fragmentation of the copper must be taken into account for more accurate prognosis of the possibility of spacecraft on-board electronics upsets.