

Swift-ion-induced hardening and reduction of dislocation mobility in LiF crystals

Manika I, Maniks J, Schwartz K

JOURNAL OF PHYSICS D- APPLIED PHYSICS 41 (2008) 074008/1-074008/5

Ion-induced change in Vickers hardness and arm length of dislocation rosettes created by indentation on the (1 0 0) face of LiF crystals was studied. The irradiations were performed using swift U, Bi and Ni ions with a specific energy of 11 MeV per nucleon at fluences between 10^6 and 10^{13} ions cm^{-2} . Remarkable effects of the ion-induced hardening and reduction of dislocation arm length were observed above the threshold fluences of about 10^9 – 10^{10} ions cm^{-2} and 10^6 – 10^7 ions cm^{-2} , respectively. The products of track core damage and aggregates of single defects in the halo of overlapping tracks are responsible for the effects.

The results are analysed using the Orowan's model of dislocation impeding by strong obstacles. The advantages of the dislocation mobility method for the diagnostics of track damage at low-fluence irradiations are demonstrated.