Thermal spike effect on defect evolution in NaCl irradiated with light and heavy ions at 8 and 300 K

Schwartz K, Volkov AE, Voss KO, Sorokin MV, Trautmann C, Neumann R
NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS 245 (2006) 204-209

Single crystals of NaCl were irradiated at room temperature and at 8 K with energetic heavy ions (^{12}C, ^{50}Ti, ^{58}Ni, ^{74}Kr, ^{152}Sm, ^{197}Au, ^{208}Pb and ^{238}U) of 50–2600 MeV providing mean electronic energy loss values from 0.7 to 19 keV/nm. The creation and evolution of color centers were investigated as a function of fluence and temperature by in situ absorption spectroscopy and thermo-stimulated luminescence, complemented by thermal annealing and optical bleaching. For irradiations at 8 K, primary hole centers are observed which typically annihilate at temperatures between 10 and 80 K. The efficiency of color center creation at 8 K strongly depends on the energy loss of the ions and is several times higher for U and Au ions than for C and Ti ions. Thermal spike estimations, taking into account the finite velocity of heat propagation, assign these effects to thermal stimulated separation of color centers in the genetic Frenkel pairs.