

Single-ion tracks in $\text{Gd}_2\text{Zr}_{2-x}\text{Ti}_x\text{O}_7$ pyrochlores irradiated with swift heavy ions

Lang M, Lian J, Zhang J, Zhang F, Weber WJ, Trautmann C, Ewing RC
Physical Review B 79 (2009) 224105

Swift xenon ions (1.43 GeV) were used to systematically investigate the radiation response of pyrochlores in the $\text{Gd}_2\text{Zr}_{2-x}\text{Ti}_x\text{O}_7$ binary in the electronic energy loss regime. Ion-induced structural modifications were characterized by synchrotron x-ray diffraction, Raman spectroscopy, and transmission electron microscopy. The structure of ion tracks depends on the pyrochlore composition, and the damage cross section increases with the Ti content. In general, single ion tracks consist of an amorphous track core, surrounded by a crystalline, but disordered, defect-fluorite-structured shell. That is in turn surrounded by a defect-rich pyrochlore region. The decrease in the size of these different track zones, with increasing Zr content, is a result of the enhanced radiation stability of Zr-rich pyrochlore within individual swift heavy ion tracks.