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ION TRACKS IN NANOCRYSTALLINE OXIDES INDUCED BY SWIFT HEAVY IONS

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Mutali A.1,2,3, Ibrayeva A.1, A.Sohatsky A.3, Janse Van Vuuren A.4, O'Connell J.4, Zdorovets M.1,2, Skuratov V.A.3,5,6

1Institute of Nuclear Physics, Almaty, Kazakhstan
2L.N. Gumilyov Eurasian National University, Astana, Kazakhstan
3Flerov Laboratory of Nuclear Research, Joint Institute for Nuclear Research, Dubna, Russia
4Nelson Mandela University, Port Elizabeth, South Africa
5National Research Nuclear University MEPhI, Moscow, Russia
6Dubna State University, Dubna, Russia

The structural modification of materials exposed to energetic heavy ions is of both fundamental and practical interest. Latent tracks are specific defects produced in many solids, particularly ceramics, by irradiation with swift heavy ions (SHIs) due to electronic excitations. The track formation process requires electronic energy loss (Se) over a material specific threshold level. Typical parameters of interest when considering a material's tolerance to SHI irradiation are the threshold Se (Sth), the size of any tracks that are produced and the morphology of produced tracks. Transmission electron microscopy (TEM), being the only experimental technique capable of directly imaging latent ion tracks, is perfectly suited to the characterization of SHI irradiated crystals.
The nanocrystalline oxide ceramics were irradiated with high energy (100 MeV - 714 MeV) Kr, Xe and Bi ions at room temperature at the IC-100, U-400 and DC-60 cyclotrons in FLNR JINR (Dubna, Russia) and Astana Branch of Institute of Nuclear Physics (Astana, Kazakhstan). TEM examination was carried out at the Flerov Laboratory of Nuclear Reactions, JINR, Dubna, Russia using a FEI TalosTM F200i S/TEM (Waltham, MA, USA). We compare ion track parameters in nanocrystalline and bulk ceramics paying a special attention to the electronic stopping power range close to the threshold for a track formation.

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Primary author: MUTALI, Alisher (Institute of Nuclear Physics (INP))

Co-authors: SOHATSKY, Alexander (Flerov Laboratory of Nuclear Research, Joint Institute for Nuclear Research, Dubna, Russia); Dr IBRAYEVA, Anel (Institute of Nuclear Physics, Almaty, Kazakhstan); Dr JANSE VAN VUUREN, Arno (Nelson Mandela University, Port Elizabeth, South Africa); Dr O'CONNELL, Jacques (Nelson Mandela University, Port Elizabeth, South Africa); ZDOROVETS, Maxim (Institute of Nuclear Physics, Almaty, Kazakhstan); SKURATOV, Vladimir (Flerov Laboratory of Nuclear Research, Joint Institute for Nuclear Research, Dubna, Russia)

Presenter: MUTALI, Alisher (Institute of Nuclear Physics (INP))

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