

High resolution electron microscopy of heavy-ion defects in superconducting Bi-2212 thin films in relation to their effect on J_c

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$\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ thin films were irradiated with 200 MeV ^{40}Ca , 1162 MeV and 2640 MeV ^{197}Au and 1404 MeV ^{238}U ions. The radiation-induced defects in the films were investigated with high resolution electron microscopy (HREM) both in cross-section and in-plane view. The HREM study shows that swift heavy ions produce well defined latent columnar tracks consisting of totally amorphized material divided by a sharp transition from the surrounding crystalline material. In-situ measurements of the transport critical current density J_c on a single sample irradiated first with Ca then with Au ions were performed. Correlations of the transport measurements with HREM data show clearly that continuous columnar defects (^{197}Au , ^{238}U) are more efficient pinning centers than scattered defect cascades (^{40}Ca).