

Channeling 2018



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Enhancement of the Inelastic Nuclear Interaction Rate in Crystals via Anti-Channeling

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The interaction rate of a charged particle beam with the atomic nuclei of a target varies significantly if the target has an ordered structure. In particular, under specific orientations of the target with respect to the incident beam, the probability of inelastic interaction with nuclei can be enhanced with respect to the standard rate. This effect can be advantageously used in the cases where the interaction between beam and target has to be maximised. A dedicated set of experimental measurements were carried out at the INFN Legnaro Laboratories with the AN2000 and CN accelerators to prove the existence of this effect. The variation of the interaction yield at hundreds of keV to MeV energies was proved by means of sapphire and indium phosphide crystals, achieving an enhancement of the interaction rate up to 73% and 25%, respectively. Such result may pave the way to the development of novel type of nozzle for the existing cyclotrons, which can exploit crystalline materials as targets for radioisotopes production, specially to enhance the production rate for expensive prime materials with minor upgrades of the current instrumentation.

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