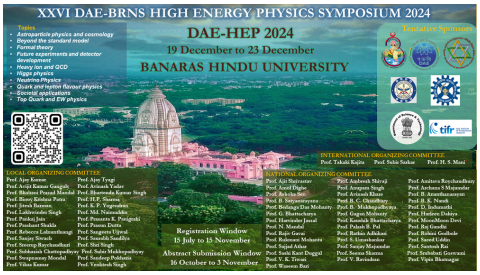

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Investigation of the Quenching Factor for Silicon and Germanium using Molecular Dynamics Simulations

The quenching factor is a crucial parameter for accurately analyzing nuclear recoil data in dark matter searches, as well as in neutron and coherent neutrino scattering experiments. In this study, we investigate nuclear and electronic stopping powers in self-irradiated silicon and germanium matrices to understand energy loss behaviors. Using the LAMMPS molecular dynamics package with a (3x3x3 Å) simulation cell, we calculated stopping powers for silicon and germanium targets at kinetic energies ranging from 1 eV to 10 keV. Our calculated stopping powers for both nuclear and electron interactions in silicon and germanium were compared with available experimental measurements to validate our results. We also discuss the systematic uncertainties associated with this approach, which are crucial for reliable quenching factor evaluation and interpretation of experimental data in related fields.

Field of contribution

Experiment

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Track Classification: Future experiments and detector development