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Proton-induced fission of 232Th and 238U for RI beam production at RAON

Proton-induced fission of ^{232}Th and ^{238}U at tens-of-MeV energies has been studied. This type of reactions is commonly used in the isotope separation on-line (ISOL) technique, which provides high-quality and intense rare isotope (RI) beams. This work aims to estimate RI beam yields for application at RAON, Korea's heavy-ion accelerator. A stochastic model based on the Langevin approach is employed to describe the shape evolution of excited compound nuclei (^{233}Pa and ^{239}Np), incorporating the fluctuation-dissipation theorem. Shell correction energies, which vary with excitation energy, are included in a potential energy surface (PES) based on the liquid-drop model. A multi-chance fission (MCF) framework, utilizing the Fermi gas model, accounts for the persistence of shell effects at high excitation energies, which prevent the mass distribution of fission fragments from becoming symmetric. The contribution of each fission chance in the MCF is compared with the GEF, and both sets of results were further compared with experimental data, confirming the accuracy of the proposed method for estimating RI production yields.

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