Frontiers in Gamma Ray Spectroscopy FIG18

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Incomplete Fusion Dynamics in 16O + 154Sm system

Content :

Incomplete fusion (ICF) dynamics of heavy ion (HI) interaction with different targets has been a topic of resurgent interest at energies above the Coulomb barrier [1-2]. At these energies, the most dominant reaction modes are complete fusion (CF) and incomplete fusion (ICF) process. In complete fusion (CF) process, the projectile is completely fused with the target nucleus, forming a highly excited compound system, which decays by evaporating low energy nuclear particles and alpha particles at equilibrium stage. In ICF process, only a part of projectile fuses with the target nucleus and form an excited composite system, while remaining part of projectile moves in the forward cone. An attempt has been used to study the CF and ICF dynamics by measurement of spin distribution of ERs using HI projectile with deformed target nucleus. The present particle-γ coincidence experiment have been performed using 15UD Pelletron Accelerator facility at Inter University Accelerator (IUAC), New Delhi, India. Gamma Detector Array (GDA) coupled with Charged Particle Detector Array (CPDA) experiment setup was used. The experiment for the system 16O + 154Sm at projectile energy 100 MeV was performed. A self-supporting target of 154Sm (enrichment ≈98.69%) were prepared by rolling machine. In-beam prompt γ-ray spectra have been recorded in multi-parameter mode employing different gating conditions. The identification of CF and ICF products were carried out by using α-backward and α-forward gated γ-spectra. Spin distribution for several evaporation residues populated through xn, αxn and 2αxn channels have been measured. The experimentally observed spin distribution for the fast-α particle emitting (ICF) channels have been found to be distinctly different than that observed for fusion-evaporation (CF) channels. The driving input angular momenta of ICF products have been found to be relatively higher than CF products and increases with fast α-multiplicity. In the present work, entirely different feeding intensity patterns are observed in fast-α particle emitting channels (ICF) and fusion-evaporation (CF) channels. The fusion-evaporation channels (CF channels) are found to be strongly fed over a broad spin range, while fast -α particle emitting channels (ICF) narrow range feeding for only high spin states was observed. The present measurements show that target deformation is also affect the ICF dynamics.

References:
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