Properties of projectile-like fragments from peripheral nuclear collisions of ^{86}Kr (25 MeV/nucleon) on ^{208}Pb

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Multinucleon transfer in peripheral reactions is of great interest to the nuclear physics community as it is a useful tool to produce neutron-rich nuclei. Notably, neutron-rich nuclei from Fe (Z=26) and above take part in the astrophysical rapid neutron capture process (known as r-process) which is mainly responsible for the production of elements above iron[1].

In this work, we studied the mass and momentum distributions of projectile-like fragments from the reaction of an ^{86}Kr beam with a ^{208}Pb target at 25 MeV/nucleon. The experimental data were obtained in previous works of our group [2] with the MARS spectrometer at the Cyclotron Institute of Texas A&M University.

Experimental mass and momentum distributions of the fragments were compared with calculations performed with the Deep Inelastic Transfer model (DIT) [3] and the Constrained Molecular Dynamics model (CoMD) [4] followed by the de-excitation code GEMINI [5]. We included in our distributions the primary excited projectile-like fragments calculated from the theoretical models. Our calculations provided an overall satisfactory description of the experimental distributions, indicating also directions for possible improvements.

We think that the systematic study of the yields and momentum distributions of the products from peripheral heavy-ion collisions can provide valuable information regarding the mechanisms of nuclear reactions in the Fermi energy regime (15-35 MeV/nucleon). This, in turn, can give guidance to the production and study of neutron-rich nuclides participating in the r-process nucleosynthesis.

References:

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