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Analysis of kinetic energy dissipation for the production of neutron-rich nuclei in multi-nucleon transfer reaction

Synthesis of neutron-rich nuclei is important for the study of Islands of Stability and r-process. However, to produce the neutron-rich nuclei in heavy mass regions will be limited by conventional fusion reactions. Therefore, in recent years, multi-nucleon transfer (MNT) reactions have attracted attention as a method of producing neutron-rich nuclei [1]. However, the reaction mechanism is not yet well understood due to its novelty and complexity. In the future, it will be necessary to estimate the physical quantity of evaporation residue (ER) in the production of neutron-rich nuclei of heavy and superheavy nuclei. In this study, we construct a dynamical model that describes the dynamics of the MNT reaction and verify the model by comparing it with experimental data to clarify the reaction mechanism.

This study aims of deal with the production of neutron-rich nuclei in heavy and superheavy elemental regions. We have been studying the angular momentum of compound nuclei produced in the MNT reaction. The results show that the angular momentum brought into the compound nucleus is affected by the contact time between the projectile and the target. It is also known that the contact time varies with the collision angle between the projectile and target. In this study, we have also included the effect of kinetic energy dissipation that contributes to the reaction of neutron-rich nuclei after their production.

The theoretical model we use is based on the two-center shell model to describe the configuration of nuclei [2]. The time evolution of the configuration is described by the multidimensional Langevin equation [3]. In this presentation, the effect of using deformed target nucleus and the effect of collision angle with deformed target nucleus are discussed from the viewpoint of kinetic energy dissipation, based on the results of dynamical model calculations.

References
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