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Analysis of angular momentum of produced nuclei and particle emission angles in multinucleon transfer reactions/多核子移行反応における生成核の角運動量と粒子放出角度の解析

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The analysis of the properties of nuclei in the neutron-rich region, one of the challenges in nuclear reactions, is very important in the study of superheavy element synthesis and the r-process in astrophysics. However, most nuclei in this region are not yet known [1]. As a means of reaching this region, a method based on multinucleon transfer reactions has been proposed [2].

At present, experimental studies on multinucleon transfer reactions have intensified with the development of accelerators and other experimental techniques [3]. However, the physical mechanism of the multinucleon transfer reaction itself has not been completely clarified. In this respect, it is essential to contribute to experimental studies through theoretical approaches.

In this study, a theoretical dynamical model applying the Langevin equation was used to analyze multinucleon transfer reactions targeting a spherical nucleus. Correlations between the particle emission angle and the number of transferred nucleons, which can be measured experimentally, and the angular momentum of the product nucleus, which cannot be measured experimentally, were investigated. This is important for multinucleon transfer reactions because the survival probability depends on the angular momentum of the produced nuclei. We report on the correlation of each parameter since the calculations were performed in a reaction using an Xe beam and a target nucleus.

References

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