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The origin of correlation between mass and angle in quasi-fission

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Mass-angle distribution (MAD) measurement of heavy and superheavy element fragmentation reactions is one of the powerful tools for investigating the mechanism of fission and fusion process. MAD shows a strong correlation between mass and angle when the quasi-fission event is dominant. It has characteristic that appears diagonal correlation as long as the quasi-fission event is dominant. This diagonal correlation could not be reproduced in previous our model before the introduction of the parameters.
In this study, we systematically evaluate the uncertainty model parameters contained in our model and clarify those model parameters to reproduce the diagonal correlation that appears in MAD. Using a dynamical model based on the fluctuation diffraction theorem that employs Langevin equations, we calculate the mass angle distribution and mass distribution of the four reaction systems 48Ti + 186W, 34S + 232Th, 48Ti + 208Pb, and 28S + 238U, which are dominated by quasi-fission. We were able to clarify the effects of uncertain model parameters on the mass angle distribution and mass distribution. In addition, we identified the values of model parameters that can reproduce the correlation between mass and angle. As a result, it found that the balance of tangential friction and moment of inertia values is important for the correlation between mass and angle.

Primary author: AMANO, Shota (Kindai University)

Co-authors: ARITOMO, Yoshihiro (Kindai University); ISHIZAKI, Shoma (Kindai university); OKUBAYASHI, Mizuki (Kindai University); OKUGAWA, Seiya (Kindai university)

Presenter: AMANO, Shota (Kindai University)

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