Contribution ID: **10** Type: **not specified**

Systematic evaluation toward predicting low-energy heavy-ion reactions using dynamical model/動力学模型を用いた低エネルギー重イオン反応の予測に向けた系統的な評価

Thursday, 20 November 2025 16:45 (1h 25m)

The history of element synthesis (Z>92) began with the discovery of $_{93}$Np in 1940. Since then, elements up to $_{118}$Og have been officially recognized. The superheavy elements from $_{114}$Fl to $_{118}$Og were first successfully synthesized directly using a ^{48}Ca projectile. However, this approach is considered impractical for element 119 due to the extreme difficulty in producing a viable target of $_{99}$Es. Therefore, reactions with new projectiles ($_{22}$Ti, $_{23}$V, $_{24}$Cr) must be explored. However, the fusion mechanisms for these reactions remain poorly understood largely due to the complexity of the compound nucleus formation process. As these dynamics cannot be directly observed experimentally, indirect methods are required. D. J. Hinde et al. offered such an approach, gaining insights from the Mass-Angle Distribution (MAD) —the correlation between fission fragments and their scattering angles[1]. Our research aims to theoretically reproduce these MADs. This will facilitate a systematic evaluation of heavy-ion reactions and ultimately allow for predictions in unexplored reaction systems.
For this analysis, we employ a dynamical model that determines the nuclear shape and its corresponding potential based on the liquid drop model and shell effects. By solving the Langevin equation, this model traces the time evolution of the nuclear shape from fusion through to fission[2,3].
We perform calculations to reproduce the experimental results of ref. [4] and analyze the shape evolution leading to compound nucleus formation.

References

[1] D. J. Hinde *et al.*, Phys. Rev. Lett. 101, 092701(2008)
[2] J. Maruhn and W. Greiner, Z. Phys 251, (1972)
[3] V. Zagrebaev and W. Greiner, J. Phys. G 34, (2007)
[4] R. du Rietz *et al.*, Phys. Rev. C 88, 054618 (2013)

Primary author: UENO/上野, Masaki/雅己 (Kindai University/近畿大学)

Co-author: ARITOMO/有友, Yoshihiko/嘉浩 (Kindai University/近畿大学)

Presenter: UENO/上野, Masaki/雅己 (Kindai University/近畿大学)

Session Classification: Poster Session / ポスターセッション