Target effect on fragmentation reactions at $E = 290A$ MeV

S. Momota[1], M. Kanazawa[2], A. Kitagawa[2], S. Sato[2], Y. Nojiri[1]

[1]*Kochi University of Technology, 185, Tosayamada-cho, Kami-shi, Kochi, 782-8502, Japan*
[2]*NIRS, 4-9-1, Anagawa, Inage-ku, Chiba-shi, 263-8555, Japan*

To disclose the mechanism of projectile fragmentation process at intermediate energies, momentum distributions and production cross-sections of projectile-like fragments (PLFs) were measured with various targets at $E = 290A$ MeV. The present results are also useful to predict the intensity of RNB produced at next generation RNB facilities, such as RIBF at RIKEN, and to improve the heavy ion cancer therapy.

The longitudinal and transverse momentum (P_L and P_T) distributions of PLFs, which were produced with an Ar beam and various targets (C, Al, Nb, Tb, Au), were measured by using HIMAC at NIRS. Target effect is found in observed momentum distributions. As an example, P_T distributions of ^{39}Cl with heavier targets (Nb, Tb, Au), which is produced through 1-proton removal reaction, are shown in Fig. 1. Observed P_T distributions are wider than that calculated based on the contributions of Fermi momentum of removed nucleon [1] and a deflection of projectile by nuclear force of target [2]. The width of P_T distributions increases with atomic number of target. It is plausible that these attitudes would be understood by interference between nuclear force and Coulomb force, which projectile feels during fragmentation process. Such target effect will be analyzed by microscopic calculations, for instance quantum molecular dynamics.

By integrating observed momentum distributions, production cross-sections of PLFs (σ_F) with $Z = 5 \sim 18$ and of a few isotopes produced through exchange or pickup reactions are derived. As an example, the isotopic and isotonic distributions of σ_F, which are produced with Au target, are shown in Figure 2. It is found in the figure that observed σ_F is roughly reproduced by EPAX2 [3]. It is implied that even-odd systematics would be explained by paring effect. A shell effect is also found in the figure and remarkable for isotonic distribution. These are also observed with other targets. Observed σ_F and its systematics will be analyzed by statistical abrasion-ablation model and microscopic calculations.

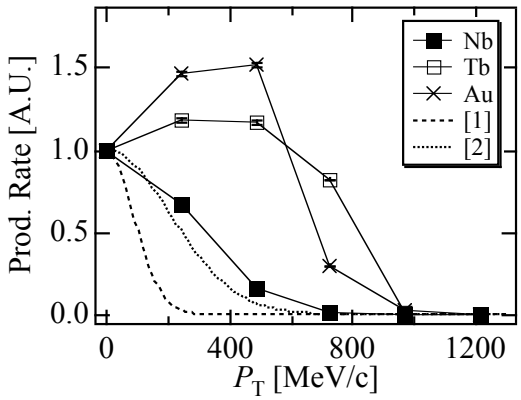

Fig. 1 P_T distributions of ^{39}Cl.

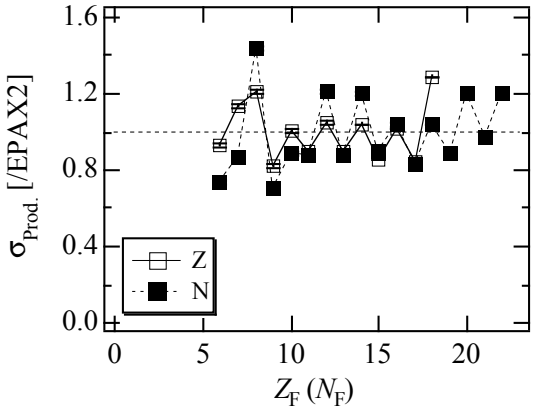

Fig. 2 Isotopic and isotonic distributions of σ_F measured with Au target.

[1] A.S. Goldhaber, Phys. Lett. **53B**, 306 (1974).

[2] K. Van Bibber et al., Phys. Rev. Lett. **43**, 840 (1979).

[3] K. Sümmerer and B. Blank, Phys. Rev. C **61**, 034607 (2000).