In-beam fission study at JAEA

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Current activity of in-beam fission study at the JAEA tandem-booster facility will be presented.

Fusion reactions using actinide target nuclei are extensively used to investigate super-heavy nuclei (SHN). The reasons are (1) a relatively neutron rich SHN compared to the cold fusion reactions are produced, thus the decay properties of these nuclei have information on the structure in the vicinity of the spherically closed-shell at N=184, (2) nuclei having a relatively long half-lives allows a study of the chemical properties, and (3) the cross sections maintain values of a few picobarn even for the production of the heaviest elements [1]. In JAEA, we are studying reaction mechanism in the in-beam fission experiment for reactions using ^{238}U target nucleus, ^{30}Si,^{31}P,^{34,36}S,^{40}Ar,^{40,48}Ca + ^{238}U [2-5]. The mass distributions changed drastically with incident energy. The results are explained by a change of the ratio between fusion and qasifission with nuclear orientation. A calculation based on a fluctuation dissipation model reproduced the mass distributions and their energy dependence [6]. Fusion probabilities determined in this approach are consistent from those determined from the evaporation residue cross sections of ^{263,264}Sg [3] and ^{267,268}Hs [4] produced in the reactions of ^{30}Si + ^{238}U and ^{34}S + ^{238}U, respectively. Discussion will be given in the ^{48}Ca + ^{238}U reaction, leading to the copernicium isotopes (Z=112) [7,8].

The other study is fission followed by nucleon transfer. In transfer reaction, relatively neutron-rich nucleus is produced. The excitation energy dependence of the fission probability gives fission barrier height of the nucleus. We will also show the fission fragment mass distribution for actinide nuclei populated by the transfer reaction in ^{18}O + ^{238}U.

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