The time scale of quasifission process in the reactions with heavy ions

G.N. Knyazheva
FLNR, Joint Institute for Nuclear Research, Dubna 141980, Russia

In reactions with heavy ions complete fusion and quasifission (QF) are competing processes. The relative contribution of QF to the capture cross section becomes dominant for superheavy composite systems and compound nucleus formation is hindered by the QF process. The balance between the two processes strongly depends on the entrance channel properties, such as mass-asymmetry, deformation of interacting nuclei, collision energy and the Coulomb factor Z_1Z_2.

Despite the QF was discovered about 30 years ago and a lot of studies on mass and angular distributions have been done for different reactions, at present there is no systematic data on QF fragment properties, such as fragment mass, its dispersion, and TKE in dependence on incident energy and target-ion combination. In previous investigations the main attention was paid to fusion probabilities and fusion-fission properties. Many efforts have been done also in the investigations of mass-angular correlations of QF fragments in order to estimate the time scale of heavy-ion-induced reactions.

The study of mass-energy distributions of binary fragments obtained in the reactions of ^{36}S,^{48}Ca, ^{58}Fe and ^{64}Ni ions with the ^{232}Th, ^{238}U, ^{244}Pu and ^{248}Cm at energies below and above the Coulomb barrier will be presented. The properties of mass and TKE of QF fragments in dependence on interaction energy have been investigated and compared with characteristics of the fusion-fission process. To describe the quasifission mass distribution the simple model has been proposed. This model is based on the driving potential of the system and time dependent mass drift. This procedure allows to estimate QF time scale from the measured mass distributions.