Fusion-fission, quasifission and multi-nucleon transfer processes in the reactions with heavy ions

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Total Kinetic Energy – Mass distributions of fission-like fragments for the reactions of heavy ions with various targets leading to the formation of heavy and superheavy compound systems at energies near the Coulomb barrier have been investigated. The measurements have been perfomed by the two time–of–light spectrometer CORSET.

The results of the study of the properties of fission-like fragments formed in the reactions ^{40,48}Ca+^{144,154}Sm, ^{170}Er; ^{36}S+^{238}U; ^{26}Mg+^{248}Cm; ^{58}Fe+^{244}Pu; ^{64}Ni+^{238}U and ^{136}Xe+^{208}Pb will be discussed. Special attention will be paid on the symmetric fragment features in order to clarify the origin of these fragments (fission or quasifission). The influence of shell effects on the fragment yield in quasifission and multi–nucleon transfer reactions will be considered. The following important results have been obtained:

- While the relative contribution of quasifision to the capture cross section mainly depends on the reaction entrance channel properties, the features of asymmetric quasifission are determined essentially by the driving potential of a composite system.
- The major part of the asymmetric quasifission fragments peaks around the region of the Z=82 and N=126 (double magic lead) and (Z=28 and N=50) shells, and the maximum of the yield of the quasifission component is a mixing between all these shells. Hence, shell effects are everywhere present and determine the basic characteristics of fragment mass distributions.
- An alternative way for further progress in SHE can be achieved using the deep–inelastic or “inverse” quasifission reactions.