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Fission and fast fission of neutron-deficient nuclei of Hg and Pb formed in 36Ar and 40Ca induced reactions with 144,154Sm targets

Fission of neutron-deficient nuclei of sub-lead region unexpectedly showed well-pronounced asymmetric component as well as symmetric one [1]. This regenerated intensive investigations of fission properties of nuclei lying in this area of the nuclide chart.
Mass-energy distributions of fission fragments of neutron-deficient 180, 190Hg and 184,192,202Pb composite systems formed in the reactions 36Ar + 144, 154Sm and 40Ca + 144, 154Sm were measured using two-arm time-of-flight spectrometer CORSET [2] at energies near and above the Coulomb barrier. Analysis of the experimental data showed that in fission of these nuclei at rather high excitation energies (up to 85 MeV) both symmetric and asymmetric fission modes are still observed. The mass distributions of the fission fragments can be well reproduced with use of 3 asymmetric fission modes and symmetric one associated with liquid drop. This is also in good agreement with the analysis of the Total Kinetic Energy (TKE) which confirms the existence of mentioned fission modes. The asymmetric fission could be explained by the influence of the deformed proton shells Z⊠36 and Z⊠46, and spherical Z=28/50.
At incident energies when high partial waves are involved, fast fission process [3] is observed for all studied reactions. This process becomes possible due to vanishing of fission barrier of formed composite systems at large angular momenta. In this study we distinguished fission and fast fission processes by subtracting of real fission mass-TKE matrix from the total (fission+fast fission) mass-TKE distribution of binary events. Due to this procedure we defined main properties of mass and TKE distributions related to fast fission events. The obtained results will be discussed.

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