PROBING THE ASYMMETRIC FISSION OF SUB-LEAD NUCLEI AT ENERGIES ABOVE COULOMB BARRIER

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Nuclear reactions induced by heavy-ions have allowed us to probe fission dynamics of exotic nuclei situated far from the line of stability which provides new and striking features of complex nuclear reaction processes [1]. The pre-actinide nuclei lying near lead region within a narrow band of isospin ($1.48 \leq N/Z \leq 1.58$) mainly exhibit symmetric fission mode [1–3]. In an excellent work of G.N. Knyazheva *et al.* performed at FLNR, JINR, the symmetrical mass distributions were obtained in $^{16}O + ^{186}W \rightarrow ^{202}Pb$, $^{40,48}Ca + ^{144,154}Sm \rightarrow ^{192,194,202}Pb$ up to high excitation energies in addition to quasifission process in deformed nuclei ^{154}Sm which was influence by shell closer structure of fission fragments [2]. Similarly, symmetric mass distributions were observed in ^{213}At, ^{210}Po, ^{200}Pb within studied excitation energies indicating the absence of shell effects at the saddle except a small contribution of asymmetry in ^{201}Po at 30.8 MeV [3, 4].

In recent years, the influence of shell structure on the asymmetric mass distributions of extremely neutron-deficient sub-lead nuclei has been under intense scrutiny because of the scarcity of experimental data which presents only a fragmentary picture. A number of theoretical and experimental efforts have been made to unravel the mystery of asymmetric mass splits since the discovery of asymmetry in ^{180}Hg, however, major investigations are limited to even-even neutron-deficient nuclei ($^{178,180,182,190}Hg$, ^{178}Pt etc.) only [1]. It was interpreted as driven by the shell structure of the fissioning nuclei instead of the shell effects of nascent fission fragments. In a recent article, it is revealed that a single neutron can make a sudden and unprecedented shape staggering in odd-mass mercury isotopes $^{181,183,185}Hg$ [5]. Therefore, exploring the fission fragment mass-energy distributions of odd-mass mercury nuclei became interesting and thereby aimed at the U400 cyclotron of the FLNR, JINR, Dubna, using the double-arm time-of-flight spectrometer CORSET which may play a crucial role to understand the effect of deformation on asymmetric mass splits. These findings could possibly clear the picture of asymmetric mass distributions witnessed in sub-lead nuclei.

This work was supported by the Indian Department of Science and Technology (DST) and the Russian Science Foundation (RSF) (Project No. 19-42-02014).

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