Analysis of spontaneous fission in superheavy mass region using the dynamical-cluster decay model

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poster

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The spontaneous fission (SF) and α-decay mechanisms are worked out in the superheavy mass region to extract valuable information regarding nuclear structure and associated decay patterns. In general, the superheavy nuclei (SHN) are mainly identified via sequential α-decay chains from unknown nuclei to known nuclei, usually ending with the α-decaying or SF nucleus. As the dominant decay modes of SHN, α-decay and SF can be considered as the limiting factors that determine the stability of nuclear systems in the extreme mass region.

In the present work, we analyze the SF half-life of ^{267}Rf, occurring as end product in the decay chain of $^{291}116^{*}$ formed via 2n emission from the compound nucleus (CN) formed in ^{245}Cm+^{48}Ca reaction, within the formalism of dynamical cluster-decay model (DCM) based on preformation and penetration probabilities of decay fragments. Recently [1], the DCM approach was exploited to investigate α-decay chains of Z=113-118 SHN, where temperature dependence (T-effects) was included for the first time via recoil energy of the residual SHN left after x-neutron emission from the CN. In view of the reasonable agreement of the DCM based calculations [1] with the available data on α-decay half-lives, here in this work, SF half life of ^{267}Rf has been calculated and compared with the experimental data to test the extent of validity of the DCM formalism to both α-decay and SF processes. The mass fragmentation of ^{267}Rf comes out to be clearly a symmetric decay with choices of spherical or quadrupole deformed (β_2 alone) nuclei having “optimum” orientations of hot compact configurations. The near exact comparison between the calculation and data provides a unique opportunity to extend this study to other spontaneously fissioning SHN in order to extract the desired information regarding dynamical behavior of nuclear systems in the extreme mass region of Periodic table.

[1] Niyti *et al.*, Phys. Rev. C **91**, 054606 (2015).