

Level densities of heavy nuclei and fission dynamics

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Abstract

The nuclear level densities and level-density parameters in fissioning nuclei at their saddle points of fission barriers, as well as those for neutron, proton, and α -particle emission residues at the ground states are calculated for isotopic chains of superheavy nuclei with $Z = 114 - 120$ [1]. The calculations are performed with superfluid formalism using the single-particle energies obtained with the Woods-Saxon potential [2,3]. The energy dependent level-density parameter ratios are important for the estimation of the probabilities of de-excitation cascades via light particles emission in competition with splitting and thus for the determination of the survival probabilities. The influence of shell effects on energy dependence of the ratios of level-density parameters corresponding to residues of considered decay modes to those of neutron emission is studied. In the case of alpha decay, we identified the collective enhancement caused by cluster degrees of freedom to play an important role.

References

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