FOUR-DIMENSIONAL LANGEVIN DYNAMICS OF HEAVY-ION-INDUCED FISSION

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A four-dimensional dynamical model based on Langevin equations was developed and applied to study fission characteristics in a wide range of a fissility parameter and excitation energy [1].The evolution of three collective shape coordinates and K-coordinate (spin projection onto symmetric axis of fission nucleus) [2], were considered from the ground state deformation to the scission of compound nucleus into fragments. A modified one-body mechanism of nuclear dissipation with a reduction coefficient k_s of the contribution from a "wall" formula has been used in the study for modeling nuclear viscosity. The modeling of four collective coordinates allows calculating a wide set of experimental observables in fusion-fission reactions induced by heavy-ions [3]. The inclusion of K-coordinate in the dynamical consideration and use of the "chaos-weighted wall formula" with a deformation-depended scaling factor $k_s(q_1)$ lead to fairly good reproduction of variances of fission fragment mass distribution and prescission neutron multiplicity for a number of fissioning compound nuclei in a wide fissility range [4]. The four-dimensional dynamical calculations describe better experimental prescission neutron multiplicity and variances of fission fragment mass distribution for heaviest nuclei with respect to a three-dimensional dynamical model, where K-coordinate assumed to be equal to zero [5]. The estimate of a dissipation coefficient for the orientation degree of freedom $\gamma_K \simeq 0.77$ (MeV zs)$^{1/2}$ is good for heavy nuclei and a larger value of $\gamma_K \simeq 0.2$ (MeV zs)$^{1/2}$ is needed for the nuclei with mass $A_{CN} \simeq 200$.

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