Study of Pre-equilibrium Fission Based on Diffusion Model

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Abstract: In terms of numerical method of Smoluchowski equation the behavior of fission process in diffusion model has been described and analyzed, including the reliance upon time, as well as the deformation parameters at several nuclear temperatures in this paper. The fission rates and the residual probabilities inside the saddle point are calculated for fissile nucleus $n+^{238}U$ reaction and un-fissile nucleus $p+^{208}Pb$ reaction. The results indicate that there really exists a transient fission process, which means that the pre-equilibrium fission should be taken into account for the fissile nucleus at the high temperature. Oppositely, the pre-equilibrium fission could be neglected for the un-fissile nucleus. In the certain case the overshooting phenomenon of the fission rates will occur, which is mainly determined by the diffusive current at the saddle point. The higher the temperature is, the more obvious the overshooting phenomenon is. However, the emissions of the light particles accompanying the diffusion process may weaken or vanish the overshooting phenomenon.

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