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A novel method for the prediction of pre-saddle neutrons in heavy-ion induced fission reaction systems

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Abstract

The number of neutrons emitted by compound nucleus before reaching the saddle-point (v_{pre}) is calculated for ${}^{16}_{8}\mathrm{O}+{}^{208}_{82}\mathrm{Pb}$, ${}^{12}_{6}\mathrm{C}+{}^{236}_{92}\mathrm{U}$, ${}^{11}_{5}\mathrm{B}+{}^{237}_{93}\mathrm{Np}$ and ${}^{18}_{8}\mathrm{O}+{}^{197}_{79}\mathrm{Au}$, heavy-ion induced fission reaction systems. The behavior of angular anisotropies of fission fragments is normal for ${}^{16}_{8}\mathrm{O}+{}^{208}_{82}\mathrm{Pb}$ and ${}^{18}_{8}\mathrm{O}+{}^{197}_{79}\mathrm{Au}$ reaction systems, since the targets have spherical shapes. For these systems, the agreement between the angular anisotropies experimental data, as well as the predictions of standard saddle-point statistical model is high. And as the mass asymmetry, parameters α is greater than the Businaro-Gallone asymmetry parameters α_{BG} for the other two systems, the behavior of angular anisotropies of fission fragments is expected to be normal. Overall, an anomalous behavior in the angular anisotropies for these systems and the contributions of non compound nucleus events are observed.

Keywords: heavy-ion induced fission, pre-saddle neutrons, statistical models, angular distribution of fission fragments

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