FISSION PROPERTIES OF NEUTRON RICH URANIUM ISOTOPES

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Fission is a crucial phenomenon to understand r-process nucleosynthesis. Metal-poor star observations suggest a very robust r-process abundance pattern for elements heavier than Z~50. The most likely reason to achieve such a robust pattern is fission cycling. In this work, the fission properties of several heavy and superheavy nuclei are computed using the recent BCPM energy-density functional [1]. Potential energy surfaces as well as collective inertias relevant to the fission process are obtained within a mean–field approach. Spontaneous fission half-lives of 22 nuclei are computed using the semiclassical Wentzel-Kramers-Brillouin formalism. The experimental trend with mass number is well reproduced [2]. Also the parameters defining the potential energy surface are in good agreement with the experimental data. We found a strong influence of the pairing correlation strength on the collective inertias, causing large variations on the theoretical values. Encouraged by the comparison with the experimental data, we extend the investigations to the neutron-rich uranium isotopes. Fission properties of the even-even chain from the light ^{226}U up to the heavy ^{282}U are computed [2]. Very large spontaneous fission half-lives are found beyond A = 256 with a peak at the neutron magic number N = 184.

[1] M. Baldo, L. M. Robledo, P. Schuck, and X. Viñas, Phys. Rev. C 87, 064305 (2013).
[2] S. A. Giuliani and L. M. Robledo, Phys. Rev. C 88, 054325 (2013).