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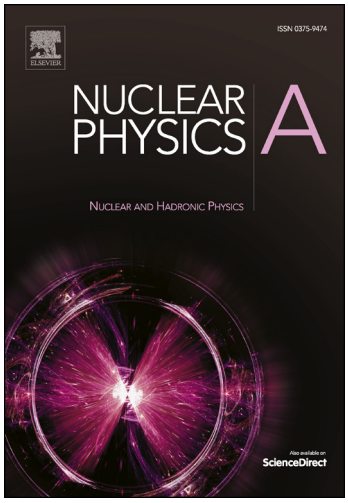

Alpha-decay of deformed superheavy nuclei as a probe of shell closures

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Alpha-decay of deformed superheavy nuclei as a probe of shell closures

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Abstract

A systematic study on α-decay half-life time, T_α, of α-particle emission from a large number of deformed heavy and superheavy nuclei is presented. The calculations are employed in the framework of the density-dependent cluster model. The microscopic α-daughter nuclear interaction potential is calculated in the framework of the double-folding model with the realistic effective Michigan-three-Yukawa Reid nucleon-nucleon interaction. We study the neutron number variation of $\log T_\alpha$ and arranged different isotones at each neutron magic number according to their stability, in the sense that the more stable isotone corresponds to the lowest value of $\log T_\alpha$. We found that the half-life time becomes minimum when the neutron or proton numbers of the corresponding daughter nucleus are magic. Moreover, the half-life time is maximum for parent nucleus with magicity. The nuclear stability is assumed to be proportional with the depth of the minimum value in $\log T_\alpha$ for the daughter nucleus or the height of its maximum value for the parent one. The neutron magic numbers predicted and confirmed from the present study are 126, 152, 162, 172, 184, 196, 202 and 212, most of them were deduced by other authors based on different methods.

Keywords: Superheavy nuclei, α-decay, shell closures.

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