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Cluster Model Analysis of Exotic Decay in Actinide Nuclei

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Abstract content
   (Max 300 words)
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The binary cluster model is used to investigate the properties of exotic structures and decays in various nuclei. Cluster structures in nuclei are currently being investigated throughout the field of nuclear physics, and although alpha-like structures are well-known to form, the investigation into the formation of exotic clusters are equally important in understanding the nuclear force and nuclear structure.
A simple method is described to determine the possible exotic clusters forming within the parent nucleus, by assuming the nucleus consists of a mixture of up to four different core-cluster pairs. A phenomenological potential is then used, with optimized parameters, to calculate exotic decay half-lives, reduced electromagnetic transition probabilities, and energy spectra by making use of a previously published description of the binary cluster model.
The range of nuclei tested includes the even-even nuclei ²²²⁻²³²Th, ²³⁰⁻²³⁴U, ²³⁶⁻²⁴⁰Pu and ²²²⁻²²⁴Ra. We found that almost all experimentally observed heavy ion emissions are predicted within the model, with calculated half-lives within a factor 3 of the experimental half-lives for at least half of the nuclei. Good agreement in the calculated values were also found for the other structure observables.

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Main supervisor (name and email)
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