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Cluster approach to the structure of Pu 240

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Abstract

© 2015 American Physical Society. The cluster approach, which allows us to take into account both shape deformation parameters and cluster degrees of freedom, is developed to describe alternating-parity rotational bands. The important ingredient of the model is the dinuclear system concept in which the wave function of the nucleus is treated as a superposition of a mononucleus and two-cluster configurations. The model is applied to describe the multiple positive and negative parity rotational bands in Pu240. The observed excitation spectrum and the angular momentum dependences of the parity splitting and of the electric E1 and E2 transition moments are explained. Special emphasis is made on the investigation of the recently measured positive parity 02+ rotational band of reflection-asymmetric nature. The results suggest that this band might be understood as being built on the lowest excited state in the mass asymmetry degree of freedom. The B(E1)/B(E2) branching ratios between the reduced transition probabilities of decay from the states of the 02+ band to the first negative parity band and to the groundstate band, respectively, are calculated and compared with experimental data.

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