Investigating the Energy Surfaces of $^{180-188}$Hg Isotopic Chain in the Shape Phase Transitional Region of the Interacting Boson Model

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Abstract

In this paper, the $^{180-188}$Hg isotopic chain is studied in the transitional region between the prolate and oblate shapes. To this aim, we have used a two-parametric transitional Hamiltonian in the interacting boson model. By using catastrophe theory in combination with the coherent state formalism, we have determined the energy surfaces in this transitional region. The results of this study for energy levels and quadrupole transition probabilities are in satisfactory agreement with the experimental counterparts. Also, the results for the control parameter of transitional Hamiltonian and the variation of energy surfaces propose a first-order phase transition in this isotopic chain and suggest the ^{188}Hg nucleus as the best candidate for the O (6) dynamical symmetry limit or Z (5) critical point symmetry.

Keywords: quantum shape phase transition, interacting boson model, energy surfaces, coherent state, Z (5) critical point

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