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SHELL MODEL DESCRIPTION OF HEAVY NUCLEI AND ABNORMAL COLLECTIVE MOTIONS

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Abstract

I present briefly our systematic calculations on the spectroscopy and transition properties of intermediate-mass and heavy nuclei around ^{100}Sn and ^{208}Pb with realistic interactions, by using the large-scale configuration interaction shell model approach. I will show that the yrast spectra of Te isotopes present a vibrational-like equally spaced pattern, but the few known E2 transitions exhibit anomalous rotational-like behavior which cannot be reproduced by collective models. Moreover, the calculated B(E2) values for neutron-deficient and heavier Te isotopes show contrasting different behaviors along the yrast line, which may be related to the enhanced neutron-proton correlation when approaching $N = 50$. I will also take Pb isotopes as example to illustrate the application of the importance-truncation approach constructed based on the monopole Hamiltonian. For those nuclei, the full shell-model results also agree well with our generalized seniority and nucleon-pair-approximation truncation calculations. The deviations between theory and experiment concerning the excitation energies and electromagnetic properties of low-lying 0^+ and 2^+ excited states and isomeric states may provide a constraint on our understanding of nuclear deformation and intruder configuration in that region.

keywords: Configuration interaction shell model, intermediate-mass nuclei, E2 transition

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