High-K isomers in exotic nuclei by a PNC-CSM method

Content

Inspired by the increased experimental observations and theoretical interest to the high-K isomeric states in exotic nuclei, take light superheavy nuclei and the neutron rich nuclei for example, the high-K isomeric states in $A \sim 250$ mass region and in Samarium, Gadolinium and Hafnium neutron rich isotopes are investigated systematically by the Cranked Shell Model (CSM) with pairing correlations treated by a Particle-Number Conserving (PNC) method, in which the particle number is conserved and the Pauli blocking effects are taken into account exactly. Comparing to $\varepsilon_6 = 0$ calculations, around 300-400keV deviation with non-zero $\varepsilon_6$ calculations can be found in both of $A \sim 250$ and $A \sim 160$ mass regions, which lead to a better reproduction of the isomer energies. The including of the high order deformation $\varepsilon_6$ results in a strengthened deformed shell gaps at $N = 152$ and $Z = 100$ in transfermium mass region. Paring reduction of the high-K isomer versus rotational frequency and the seniority $\nu$ (number of the unpaired particles) in $^{254}$No and the systematically observed $K^* = 8^-$ isomer states in $N = 150$ transfermium nuclei isotones are discussed in detail. The $BE(2)$ values systematics in neutron rich Neodymium, Samarium, Gadolinium and Dysprosium isotopes are discussed. A sharp change of the collective behavior at $Z = 62$ is found for the $N = 96, 98, 100, 102$ isotones where as the irregular variation of $BE(2)$ at neutron $N = 100$ predicted by other models is not shown in the PNC calculations. Other properties, like the configuration assignment, single-particle level structures and microscopic mechanism of the back bending of the rotational bands on the top of these isomers and so on, are discussed in detail as well.

Type of contributuion

Contributed talk

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