Investigation of the Rotational Properties in Transfermium Nuclei Using a Particle-Number Conserving Cranked Shell Model

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Nuclei with $Z \sim 100$ in the transfermium mass region are the heaviest systems accessible in present in-beam experiments. Transfermium nuclei are at the gateway to the superheavy elements (SHE) region. The study of the structure of these deformed transfermium nuclei may provide an indirect way to access the single particle states of the next closed spherical shells (see the review [1–3] and references therein).

The cranked-shell model (CSM) with pairing correlations treated by a particle-number conserving (PNC) method [4] is used to study the rotational properties in the very heavy nuclei with $Z \sim 100$. In the PNC method, the particle number is conserved and the Pauli blocking effects are taken into account exactly. By fitting the experimental single-particle spectra in these nuclei, a new set of Nilsson parameters (κ and μ) are proposed [5]. The experimental kinematic moments of inertia and the band-head energies of the rotational bands in transfermium nuclei are reproduced quite well by the PNC-CSM calculations. The structures of the single-particle states, closed sub-shell effects, deformation, pairing correlation, high-j intruder orbital and the rotational properties in these nuclei are investigated in detail [5–7].

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