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Rotations of high-K quasiparticle states

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Self-consistent configuration-constrained Total Routhian Surfaces (TRS) [1,2] have been developed to treat the collective rotations of quasiparticle states built on broken-pair excited configurations. Two types of interaction have been used for the configuration-constrained TRS calculations: the deformed Woods-Saxon potential and the two-body Skyrme force within the Hartree-Fock approximation in the ($\beta 2$, $\beta 4$, γ) deformation lattice. To avoid the pairing collapse, the particle-number-conserving (PNC) pairing was employed, which takes the shell-model diagonalization technique. The rotational bands of various quasiparticle configurations from $K\pi=7-$ to $K\pi=30+$ in 178W have been calculated, giving good agreements with data in the moments of inertia. The configuration-constrained TRS's show the deformation evolution with changing rotational frequency and configuration. The irregularities in the observed moments of inertia of the $K\pi=8-$ bands in transfermium nuclei (e.g., 252No and 250Fm) were explained by the configuration mixing (band crossing) with a two-proton $K\pi = 7-$ band [3]. Within Hartree-Fock plus PNC pairing, the configuration-constrained TRS based on the microscopic Skyrme interaction has been successfully applied to the high-K bands of Hf isotopes [2].

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