

Triaxial Strongly Deformed Bands in $^{171,172}\text{Hf}$? *

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Wobbling, a unique excitation mode of nuclei with triaxial deformation, has been established in $^{163,165,167}\text{Lu}$ and, possibly, ^{161}Lu [1]. A number of strongly deformed (SD) bands were also identified in neighboring $^{168,170,173-175}\text{Hf}$ [2], but the predicted wobbling mode was not observed. Whether these Hf bands are triaxial (TSD) or not remains an open question. In our Gammasphere experiment at ANL using the $^{48}\text{Ca}(^{128}\text{Te}, \text{xn})$ reaction, three proposed SD bands in ^{172}Hf and one in ^{171}Hf , extending up to $111/2^+$, were identified with intensities 0.9% - 3.7%, respectively. The three bands in ^{172}Hf have very similar dynamical moments of inertia ($J^{(2)}$), but the linking transitions between them, the characteristic of wobbling sequences, could not be found. The $J^{(2)}$ values of the SD bands in Hf fall into two groups, one increasing and the other decreasing (see figure). All three bands in group-A (with increasing $J^{(2)}$ values) are linked to known structures with definitive spin/parity assignments. Quasiparticle configurations involving $(\pi i_{13/2})^2 \otimes (\nu i_{13/2})^2$ or $\pi(i_{13/2}i_{11/2}) \otimes (\nu i_{13/2})^2$ were proposed for these bands. The bands in group-B seem to have higher spins and excitation energies, with deformations significantly larger than that of bands in group-A and Lu, most likely resulting from additional quasi-neutrons occupying $(\nu j_{15/2})^2$ orbitals. The Hf bands have very different intrinsic structures than the Lu bands. Theoretical calculations (cranking, particle-rotor, and RPA) agree fairly well with observations in Lu nuclei. It is also possible that Hf bands in group-A are associated with the predicted TSD minima. However, serious disagreement between calculated and measured properties of bands in group-B, majority of SD bands in Hf, constitutes a challenge for further investigations of triaxiality for nuclei in this region.

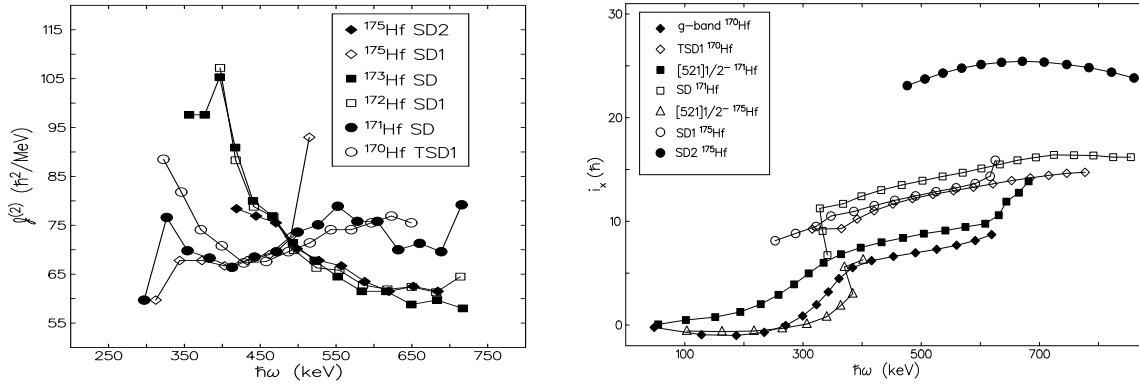


FIG. 1. Dynamical moments of inertia and alignments of SD bands in Hf isotopes.

[1] P. Bringel *et al.*, Euro. Phys. J. **A** 24, 167 (2005), and references therein.

[2] D. J. Hartley *et al.*, Phys. Lett. **B** 608, 31 (2005), and references therein.

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