Rotation around the longest principle axis in $^{142}\text{Gd}$

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A.A. PASTERNAK, A.F. Ioffe Phys. Techn. Inst., 198904 St. Petersburg, Russia — It is difficult to verify triaxial shape in nuclei and no case has been clearly established where a triaxial nucleus rotates around the longer axis ($\gamma < -60^\circ$). In view of this fact, the yrast band of $^{142}\text{Gd}$ ($Z=64, N=78$), which has been observed to $I=34$, displays some interesting features. The general properties of the band show that it is built with no particles excited across the $N=82$ gap, but with four protons excited across the $Z=64$ gap, i.e. it has a $\pi(h_{11/2})^4\nu(h_{11/2})^{-2}$ high-$j$ configuration. This configuration leads to triaxial shape with well-developed potential energy minima calculated for rotation around all three principal axes but with rotation around the intermediate axis energetically favoured at $I \approx 20$. However, a change of rotation axis takes place, because it is only for rotation around the longer axis that it is possible to build $I > 30$ states. This conclusion is based on general rules how high-$j$ particles and holes align their spin vectors, and is supported by our recent lifetime measurements indicating a small collectivity at high spins. Another interesting feature is that the yrast states around $I=40$ are predicted to be dominated by favoured terminations at prolate shape. Cranking calculations and particle-rotor calculations will be presented to support our general conclusions.

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