ID de résumé : **37**

Experimental Identification Criteria of Exotic Shapes around Octupole Magic Number $N = 136$

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We present the results from Ref.[1] where the results of the realistic mean-field calculations performed using phenomenological mean-field Hamiltonian with the deformed Woods-Saxon potential and newly adjusted parameters containing no parametric correlations (cf. Ref.[2]) were discussed. Focusing at the four octupole deformations $\alpha_{3,\mu=0,1,2,3}$, we find very large neutron shell gaps at $N = 136$, which generate well-pronounced double potential-energy minima in the standard multipole (α_{20}, α_{22}, $\alpha_{3\mu}$, α_{40}) representation, often at $\alpha_{20} = 0$. These potential minima lead to the exotic symmetries C_{2v}, D_{2d}, T_d, and D_{3h} which we will discussed in detail.

In the recent Ref.[3] the basis for the spectroscopic identification of the T_d and O_h groups were stablished. Already there it was shown that the consequent band structures of exotic symmetries are very different from the {\it traditional ones}, namely those generated from ellipsoidal symmetry with $\Delta I = 2$ sequences. Following the same scheme and with the help of the representation theory of point groups we find the spin-parity sequences for each of the mentioned symmetries above, allowing us to formulate quantum mechanical criteria for experimental identification of such exotic symmetries. We will show that their spin-parity sequences mix even and odd spins, as well as positive and negative parities.

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Déposé par **DEDES, Irene** le **lundi 4 avril 2022**