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Behavior of moment of inertia in highly deformed 24Mg and 20Ne

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We suggest the self-consistent description of the ground-state moment of inertia (MI) in highly prolate light nuclei 24Mg and 20Ne (with experimental equilibrium axial quadrupole deformations b2=0.605 and 0.72, respectively [1]). These nuclei provide an interesting opportunity to explore dependence of MI on the pairing, ground-state correlations and nuclear shape at extreme deformations. The calculations are performed with Skyrme forces SVbas, SkM*, and Sly6 for deformation range 0.3 < b2 < 0.9. Three approaches are applied [2]: Inglis-Belyaev (within Hartree-Fock-Bogoliubov method), QRPA Thouless-Valatin (within Quasiparticle Random-Phase Approximation method [3]) and ATDHF (Adiabatic Time-Dependent Hartree Fock method). For Inglis-Belyaev and ATDHF calculations, the code SKYAX [4] was used. All three approaches show that, near the equilibrium deformation, the pairing in 24Mg and 20Ne vanishes and we get the maximum of MI. With further grow of the deformation above the equilibrium values, we see decrease of MI. Such behavior of MI is explained by rearrangement of single-particle levels with deformation. The analysis reveals main two-quasiparticle contributions responsible for the behavior of MI in different regimes.

1. Database http://www.nndc.bl.gov
2. P.Ring and P.Schuck, TheNuclearMany-BodyProblem (Springer-Verlag,Berlin,1980)
3. A. Repko, J. Kvasil and V.O. Nesterenko, Phys. Rev. C 99, 044307 (2019).
4. P.-G. Reinhard, B. Schuetrumpf, and J. A. Maruhn, Comput. Phys. Commun. 258, 107603 (2021).

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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