Rotational Properties of Neutron Drip-Line Ne and Mg Nuclei *

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Moving away from stable nuclei by adding either protons or neutrons, one finally reaches the particle drip lines. The neutron-rich, weakly-bound nuclei close to the neutron drip line have very unusual properties: they are large, diffused, and superfluid [1].

In this work, the systematic behavior of rotational bands in deformed neutron-rich nuclei has been investigated with the cranked Skyrme-Hartree-Fock approach [2]. The variation of shape with rotation has been studied for the $\nu(f_{7/2})^n$ configurations in the series of even-even isotopes $^{30-38}$Ne, $^{32-40}$Mg. The Skyrme interaction SLy4 [3] has been used.

The analysis was performed in the deformation region where previous studies [4] have indicated the existence of highly deformed configurations ($\beta_2 \approx 0.35$). In particular, we studied isovector deformation effects, i.e., differences between proton and neutron deformations. According to our calculations, the quadrupole isovector deformations in the neutron-rich Ne and Mg isotopes are usually small. The strongest effect is predicted for the $\nu 3^6$ bands in the N=26 isotones at low spins. However, the difference in β_2^π and β_2^π is fairly small, it does not exceed 0.04. In all cases, proton and neutron deformations are practically identical at high angular momentum. As far as proton and neutron radii are concerned, they show very weak variation with spin. The behavior of the moments of inertia is also discussed.

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