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Deformation around neutron-rich Cr isotopes in axially symmetric Skyrme-Hatree-Fock-Bogoliubov method

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Recent experiments on the neutron rich Cr isotopes with N=36,38 suggest a new region of quadrupole deformation[1][2]. In this presentation we analyse the deformation mechanism in this region by means of a deformed Skyrme-Hartree-Fock-Bogoliubov code based on a 2D mesh representation in the cylindrical coordinate system assuming axial symmetric deformations[3].
It is found that when we adopt the Skyrme parameter set SkM* the deformation energy curves in the isotopes N=32-44 exhibit an onset of a large quadrupole deformation around N$\sim$ $38-42, but the potential energy surface is quite flat up to \beta \sim 0$
From analysis of the neutron Nilsson diagram obtained with constrained HFB calculation, we found that the deformation is sensitive to the N=38 deformed gap which arises from the down-sloping νg9/2 orbits. However the Fe (Z=26) isotopes with the same neutron number show a similarly soft potential but with smaller deformation, and the Ti isotopes (Z=22) do not exhibit deformation, indicating a combined effect of protons and neutrons. By comparing with other Skyrme parameter sets, we shall demonstrate that the deformation in this region emerges as a consequence of a delicate competition between spherical and deformed configurations, which is governed by the position of νg9/2. The deformation properties in the n-rich Cr isotopes provide us with a rather strong constraint for a proper choice of the Skyrme parameter sets.
References:
[1] O. Sorlin et al., Eur. Phys. J. A16. 55(2003).
[2] N. Aoi et al., Nucl. Phys. A in press.
[3] H. Oba, M. Matsuo, preprint 2008 Feb.

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