Int. Workshop “Shapes and Dynamics of Atomic Nuclei: Contemporary Aspects”
ed. Nikolay Minkov, Heron Press, Sofia 2019

Rod-shaped nuclei in covariant density functional theory

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Abstract

The development of worldwide rare isotope beam facilities has brought many new insights in nuclear physics. In particular, novel structure in nuclei towards extreme isospin and spin has acquired great interest over the years for the challenges and implications it involves. Theoretically, covariant density functional theory (CDFT) has achieved great success in describing many nuclear phenomena over the past several decades. In this contribution, I would like to focus on our recent progress on developing the CDFT for rod-shaped nuclei, in particular the linear-chain alpha clustering states in carbon isotopes. In Ref. [1], the anomalous rod shape in carbon isotopes has been investigated in cranking covariant density functional theory, and the coherent effects between the high spin and isospin have been discussed for the first time in the stabilization of such a novel shape. In Ref. [2], the stability of the linear chain structure against the bending and fission is further investigated in 3D lattice covariant density functional theory without any symmetry assumptions. Finally, the very recent development on time-dependent covariant density functional theory in a 3D lattice space will be briefly mentioned.

References

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[2] Z. X. Ren, S. Q. Zhang, P. W. Zhao, N. Itagaki, J. A. Maruhn, and J. Meng, *Sci. China-Phys. Mech. Astron.* **62** (2019) 112062.