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Relativistic description of novel nuclear structure towards extremes of spin and isospin

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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 particular, a new covariant functional PC-PK1 has been developed recently in Ref. [1]. It considerably improves the isospin dependence of nuclear properties, and is more reliable for the description of neutron-rich nuclei [2,3]. Based on this density functional, CDFT has also been extended for nuclear spectroscopic properties within the tilted-axis-cranking approach [4,5].

The extended CDFT has provided successful description of many novel rotational structure in nuclei towards high spin, such as the magnetic rotation [4], antimagnetic rotation [6], reorientation for nuclear spin [5], chiral rotation [7] etc. These successes have also stimulated a number of new measurements, and the interactive research between theorists and experimentalists has presented many novel rotational phenomena; several examples associated with the novel spin modes in triaxial nuclei can be seen in Refs. [8-11].

The success of CDFT in nuclear spectroscopic properties with high spin is not the only accomplishment recently achieved. Going to both the extreme isospin and spin, in Ref. [12], 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. By adding valence neutrons and rotating the system, it is found that the spin and isospin effects enhance the stability of the rod-shaped configuration. This provides a strong hint that a rod shape could be realized in nuclei towards extreme spin and isospin.

[1]. P. W. Zhao, Z. P. Li, J. M. Yao, J. Meng, Phys. Rev. C 82, 054319 (2010)

[2]. P. W. Zhao, L. S. Song, B. Sun, H. Geissel, J. Meng, Phys. Rev. C 86, 064324 (2012)

[3] P. W. Zhao, S. Q. Zhang, J. Meng, Phys. Rev. C 89, 011301(R) (2014)

[4] P. W. Zhao, S. Q. Zhang, J. Peng, H. Z. Liang, P. Ring, J. Meng, Phys. Lett. B 699, 181 (2011)

[5] P. W. Zhao, S. Q. Zhang, J. Meng, Phys. Rev. C 92, 034319 (2015)

[6] P. W. Zhao, J. Peng, H. Z. Liang, P. Ring, J. Meng, Phys. Rev. Lett. 107, 122501 (2011)

[7] P. W. Zhao, Phys. Lett. B 773, 1 (2017)

[8] J. Meng, J. Peng, S. Q. Zhang, P. W. Zhao, Front. Phys. 8, 55 (2013)

[9] A. Ayangeakaa et al., Phys. Rev. Lett. 110, 172504 (2013)

[10] E. O. Lieder et al., Phys. Rev. Lett. 112, 202502 (2014)

[11] I. Kuti et al., Phys. Rev. Lett. 113, 032501 (2013)

[12] P. W. Zhao, N. Itagaki, J. Meng, Phys. Rev. Lett. 115, 022501 (2015)

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