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Collectivity and chirality in extremely neutron deficient ^{119}Cs, ^{119}Ba, and ^{118}Cs

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The very neutron-deficient strongly-deformed ^{119}Cs, ^{119}Ba, and ^{118}Cs nuclei have been studied with the JUROGAM 3 + MARA recoil-mass separator setup. Two most complete level schemes from low to high spin in the odd-even and odd-odd proton-rich cesium nuclei, ^{119}Cs and ^{118}Cs, were observed. One new rotational band and several low-lying states were newly identified in ^{119}Ba. The configurations of the observed bands were assigned based on the analysis of the alignment properties of the bands, on systematics and on particle number conserving cranked shell model (PNC-CSM) calculations.

We observed the chiral bands built on a configuration with only protons in the transient backbending regime for the first time in ^{119}Cs. One new band which is nearly degenerate to the strongly-coupled $\pi g_{9/2}[404]9/2$ band of ^{119}Cs was identified. It exhibits a backbending similar to that of one known band, at nearly constant rotation frequency. Tilted axis cranking covariant density functional theory with pairing correlations and PNC-CSM calculations show that the backbending is induced by the rotational alignment of two $h_{11/2}$ protons, whose angular momenta reorient from the short to the intermediate axis, in a plane orthogonal to the angular momentum of the strongly-coupled $g_{9/2}$ proton which keeps aligned along the long axis. The total spin points in 3D, inducing the breaking of the chiral symmetry and giving rise to nearly degenerate doublet bands. We can conclude that the chirality in nuclei is a general phenomenon, being robust and present not only in a two-component quantum many-body system, but also in a one-component quantum many-body system as well.

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