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Octupole bands in the neutron-rich nucleus 143Ba

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The reflection asymmetric shell model (RASM) was developed to describe the high spin states in octupole deformed nuclei in Ra-Th octupole deformed nuclei [1] and neutron-rich nucleus 145Ba in Ba-Sm region[2]. In this work, RASM was performed to investigate the reflection asymmetry in 143Ba. All the observed four rotational bands are well reproduced by the present calculation with a proper octupole deformation (~ 0.08), which is consistent with the macroscopic-microscopic calculations in the literature. The two octupole deformed neutron Nilsson single-particle orbitals just below the octupole shell gap 88, with K=1/2 and K=3/2 dominate the intrinsic structure of the observed low-lying states. Based on the analysis of the calculated RASM wave functions and the pure-configuration calculation results, the assignments for the observed bands have been given. The s=+i and s=-i octupole bands are all based on the K=1/2 orbit, and they are really "parity doublets"in octupole deformed island around Z=56 and N=88. The calculated results show that the s=+i and s=-i octupole bands in 143Ba are different from the 145Ba. In 145Ba, the s=+i and s=-i octupole bands originate from the different K orbits.

[1] Y. S. Chen and Z. C. Gao, Phys. Rev. C 63, 014314 (2000).
[2] Yong-Jing Chen, Zao-Chun Gao, Yong-Shou Chen, and Ya Tu, Phys. Rev. C 91, 014317 (2015).

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