Theoretical Study of the Light Superheavy Nuclear Structure

Xiao-Tao He
College of Materials Science and Technology, Nanjing University of Aeronautics and Astronautics

The nuclear structure of the light superheavy nuclei are investigated systematically by a shell model like approach, i. e. particle-number conserving method in framework of Cranking Shell Model (PNC-CSM). The single-particle level structure, high-K isomers, rotational properties and α-decay energies of the light superheavy nuclei are studied. High-order deformation ε_6 plays an important role both in the single-particle orbitals and in the multi-particle states of the light superheavy mass region. Particular emphasis will be place on the newly obtained Nilsson parameters set of κ μ and their effect on the nuclear shell gap. The relation between the spherical shell gap in superheavy mass region and the deformed shell gap in light superheavy mass region will be discussed.

[1] **Xiao-tao He**, Zhong-zhou Ren, Shu-xin Liu and En-guang Zhao
Influence of high-j intruder orbitals in odd mass transfermium nuclei ^{253}No and ^{251}Md
Nucl. Phys. A 817, 45-60 (2009).

[2] Z.-H. Zhang, **X.-T. He**, J.-Y. Zeng, E.-G. Zhao, and S.-G. Zhou
Systematic investigation of the rotational bands in nuclei with Z ∼ 100 using a particle-number conserving method based on a cranked shell model
Phys. Rev. C 85, 014324 (2012).

[3] Yu-Chun Li, and **Xiao-Tao He**
High-K multi-particle bands and pairing reduction in ^{254}No,
Chin. Phys. C 44 (2020) 034106.

[4] T. Huang, D. Seweryniak, …, **X. T. He**, et al,.
Discovery of the new isotope ^{251}Lr: Impact of the hexacontetrapole deformation on single-proton orbital energies near the Z = 100 deformed shell gap,
Phys. Rev. C, 106, L061301 (2022).

[5] D. Seweryniak, T. Huang, …, **X. T. He**, et al,.
Nuclear rotation at the fission limit in ^{254}Rf ,
Phys. Rev. C 107, L061302 (2023).