Bubble Structure in Superheavy Nuclei

Akhilesh Yadav and A. Shukla*
Department of Physics, Rajiv Gandhi Institute of Petroleum Technology,
Jais, Amethi - 229304, India

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Abstract

The possibility of bubble structure formation along with nuclear structure systematics of superheavy nuclei, namely Z=116, 118, 120, and 122, has been investigated in Relativistic Hartree Fock Bogoliubov framework. In this study, we observe that in the case of neutron density distribution, the occurrence of central depletion is related to the occupancy of 4s orbital and it is found to decrease with increasing occupancy of the 4s orbital, whereas in the case of proton density distribution, the central density depletion is mainly due to the lowering of weakly bound p orbital states close to the continuum as it is energetically favored to lower the Coulomb repulsion in the case of superheavy nuclei. Also, occupation probability of the lower angular momentum states (p orbitals) lying near the Fermi level are strongly suppressed due to the weak centrifugal barrier and strong Coulomb repulsion in comparison to large angular momentum states (contributing to surface region mainly), resulting in central density depletion.

References

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