

RELATIVISTIC AND NON-RELATIVISTIC STUDY OF Z=120 ISOTOPES AND PREDICTIONS FOR THE α -DECAY CHAINS OF ^{292,298,299,304}120 NUCLEI

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The ground state of superheavy nuclei with $Z = 120$ and $N = 160$ – 190 are investigated using both non-relativistic Skyrme–Hartree–Fock (SHF) and the axially deformed relativistic mean field (RMF) formalisms. The results for isotopic chain of binding energy (BE), quadruple deformation parameter, two neutron separation energies and some other observables are compared with the finite range droplet model (FRDM). A shape change have been observed in both RMF and SHF for $Z=120$ isotopic chains which confirms the shape transition behaviour in this chain. The neutron magic number i.e. $N=172$ and $N=184$ have been also predicted with almost all relativistic and non-relativistic forces using different signatures (S_{2n} , δ_{2n} , $E_{\text{pair}, n}$) taken into account. Qualitatively similar predictions in both formalism have been found and the results obtained here are also consistent with different forces taken into account. Apart from it, α -decay chains of ^{292,298,299}120 and ³⁰⁴120 are also studied within these frameworks. The Q_α -values and the half-life $T_{1/2}$ for these decay chains are compared with FRDM and experimental results available wherever. A comparison of calculated α half-life for different relativistic and non-relativistic interactions show good agreement with each other. A detail study on the spontaneous fission half-lives of all the isotopes under study has been performed to identify the mode of decay of these isotopes. The α -decay half-lives and the mode of decay of the isotopes of ^{292,298,299}120 and ³⁰⁴120, evaluated using different interactions agree well within each other and the experimental observations.