Shell Model Calculations of Even-A Nuclides on the Neighbourhood of ⁴⁰Ca Core

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Significant advances in the development of experimental techniques and radioactive beams have made it possible to explore more exotic nuclei, particularly those located on drip lines and on the paths of the astrophysical processes. These nuclei have long been a major focus of both experimental and theoretical research. Of particular interest in the nuclear structure studies, the very exotic proton rich nuclei located beyond the ⁴⁰Ca region are motivating. These nuclides are discovered along the proton-rich side by the rapid proton capture process. Consequently, knowledge of their spectroscopic properties and decay modes makes it possible to simulate and model astrophysical explosive phenomena [1]. We investigate even-A nuclei in the vicinity of *rp-process* path within the framework of nuclear shell model using the NuShellX@MSU nuclear structure code [2]. This study is based on the fp valence space composed of eight proton and neutron orbitals with single particle energies outside the doubly magic core ⁴⁰Ca nucleus. The code's effective interaction [3] was adopted in the pn-formalism. Calculations were performed on isotopes with equal numbers of protons and neutrons (Z = N). Some nuclear spectroscopic properties have been determined. The obtained results have been then compared with the available experimental Data [4].

References

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