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Projected Shell Model Study of Some Odd-Odd Nuclei in A~70 mass region

Odd-odd nuclei are good candidates for probing shell structures away from the valley of stability. In general, odd-odd nuclei are difficult to study as they can have coexisting low-lying two-quasiparticle states (in contrast to even-even nuclei),i.e., in odd-odd nuclei, the energy differences between low-lying 2-qp states can be very small (less than 100 keV). Such small differences are difficult for model calculations to reproduce and hence understanding their intricate structure becomes difficult. Owing to these reasons, very less work has been devoted to study the odd-odd nuclei in comparison to even-even or odd mass nuclei. So, we decided to take up the study of odd-odd nuclei by employing the theoretical framework of Projected Shell Model (PSM). One may note that PSM, which has been broadly applied to study the various nuclei throughout the Segre's chart, has rather less extensively used for studying the doubly odd nuclei. For the present work, we have focused on studying the nuclear structure of A~70 odd-odd nuclei as we have already successfully described the nuclear structure of even-even & odd-mass nuclei in this mass region and hence studying odd-odd nuclei using same interaction Hamiltonian of PSM can help in providing the unified description of the nuclei falling in this mass region. The doubly-odd nuclei chosen for the present study are the copper, gallium and arsenic isotopes, having single-, three- and five- protons, respectively coupling to the underlying Z=28 nickel core. The results are obtained for the deformations, energy spectra, intrinsic quasiparticle structures, back bending in MOI, rotational frequencies, B(M1)s, B(E2)s, rotational alignments, etc. The calculations have not only reproduced the already available data reasonably well but at the same time have also predicted new data on some of the nuclear structure properties of these nuclei which is open for its experimental verification in the near future.

Primary author: Dr VERMA, Preeti (central university of jammu)

Co-authors: Dr SINGH, Suram (Central University of Jammu); Prof. KHOSA, S.K. (central university of jammu)

Presenter: Dr VERMA, Preeti (central university of jammu)

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