Recent results from INGA on excitations of transitional nuclei

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Study of band structures of nuclei from symmetry consideration plays an important role in understanding different phenomena in nuclear structure. In selected regions of nuclear landscape, axial symmetry is broken and these nuclei, referred to as transitional nuclei, are described using the triaxial deformed mean-field. There are several empirical observations indicating that axial symmetry is broken in transitional regions. The structure of the gamma vibrational bands and its decay provide information about the nature of triaxial shapes. In addition, the chiral rotation is uniquely related to the triaxial nuclear shapes. Recently, RMF calculations [1] predict multiple chiral bands in some of the odd-odd isotopes of Ag, Rh and In owing to their triaxial shape. In the present paper, we would discuss the recent results from gamma-spectroscopy study on odd-odd isotopes in A $\sim$ 110 region [2, 3].

The experiments were performed using the Indian National Gamma detector Array (INGA) consisting of Compton suppressed clover detectors. Currently, INGA is set up at Pelletron Linac accelerator facility at Mumbai, as a part of a collaboration between BARC, IUAC, SINP, TIFR, UGC-CSR-KC, VECC and different Universities. The array is designed for 24 Compton suppressed clover detectors providing around 5% photopeak efficiency. Recently, a digital data acquisition system with 96 channels (based on Pixie-16 modules developed by XIA LLC) has been implemented for this Compton suppressed clover array [4].

A detailed spectroscopic study has been carried out for ^{112}In with the INGA using ^{16}O + ^{100}Mo reaction. The polarization and lifetime measurements were performed for the two strongly populated dipole bands. Comparison of the tilted axis cranking model calculation with the measured B(M1) transition strengths of the positive and negative parity bands firmly established their configurations. The measurements along with the TAC calculations suggest small axially symmetric deformation for ^{112}In at lower excitation energy in contradiction to the predictions of RMF calculations [3]. Further measurement of the crossover E2 transitions in dipole band with higher statistics is planned. In addition, the recent results on high spin states of neighbouring odd-odd isotopes will also be discussed.

References

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