INSIGHTS INTO MIRROR NUCLEI STRUCTURE: A THEORETICAL SPECTROSCOPIC STUDY OF ^{21} O AND ^{21} AL

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Abstract

The study of neutron-rich oxygen isotopes provides fundamental understanding of the evolution of nuclear shell structure near the drip line. In this work, we present a comprehensive shell-model investigation of the spectroscopic properties of the neutron-rich nucleus ^{2}1O, performed using our well-established PSDPF effective interaction. Excitation energies and electromagnetic transition rates have been calculated for both low- and high-lying states, enabling a detailed exploration of the underlying nuclear structure.

To extend this analysis, we also investigate the proton-rich mirror nucleus ^{2}1Al, for which electromagnetic transition strengths have been computed for all experimentally observed states. A systematic comparison between theoretical predictions and available experimental data is presented for both mirror partners.

Our results provide a robust theoretical benchmark for understanding the structure of A=21, T=5/2 nuclei and offer reliable predictions to guide future experimental investigations. This study further demonstrates the predictive power and versatility of the PSDPF interaction in describing the complex properties of neutron- and proton-rich nuclei. A detailed discussion of these findings will be presented.