Nuclear Structure of Rare Isotopes in the *sd*-Shell Region

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Studying nuclear structure in rare isotopes within the *sd*-shell region offers valuable insights into the evolving nature of nuclear forces, shell evolution, and configuration mixing far from stability. In order to fully understand the structure of each nucleus being examined, we need to study the specific aspects of spectroscopic properties such as excitation energies, spin and parity assignments, and lifetimes that are necessary in each instance.
The shell model study has been performed using the PSDPF interaction in a large model space $(0+1)\hbar\omega$ to calculate the complete energy spectra of both positive and negative parity states the sd-shell rare isotopes: ^{18}Mg, ^{26}Al, ^{32}Ne, and ^{36}Cl and compare them with experimental data. We systematically compare theoretical results for excitation energies, electromagnetic transition strengths, and ground-state properties with available experimental data. The obtained results are in quite good agreement with experiment, which gives credit to our PSDPF interaction. A detailed discussion of our work will be presented in this contribution.