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Spectroscopy and Cross Sections of Near-Drip Line N=28 Aluminum and Island of Inversion Neon Produced by Nucleon Knockout Reactions

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The shell model lays an impressive foundation for broad understanding of nuclear systems. For the most exotic nuclei, universal mechanisms drive shell evolution from established structures, such as the disappearance of canonical magic numbers. The spin-isospin parts of the nucleon-nucleon interaction, and specifically, the monopole part of the tensor force between different orbits is a strong driver of these transformations.

Two areas of drastic shell evolution, the N=20 Island of Inversion and the N=28 neutron-rich region are studied through nucleon knockout reactions and in-beam gamma spectroscopy. The extension of systematic characteristics of collectivity and single-particle structures are investigated in near-drip line neon (32-Ne) and aluminum (39-Al, 40-Al and 41-Al) isotopes at the RIKEN Nishina Center Radioactive Isotope Beam Factory (RIBF). In-beam gamma spectroscopy is one of the few experimental techniques to comprehensively study these isotopes with unbound beta-decay parents. In addition, the measured inclusive and exclusive knockout reaction cross sections in combination with shell model calculations and reaction theory extends systematic trends of one and two-nucleon knockout reduction factors.

Selected session

Nuclear structure

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