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Decay Spectroscopy of Deformed, Neutron-rich Nuclei: Nuclear Structure and Role of K Forbiddenness*

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Properties of deformed, neutron-rich nuclei in the A~110 and 160 mass regions are important for achieving better understanding of the nuclear structure where little is known owing to difficulties in the production of these nuclei at the present RIB facilities. They are essential ingredient in the interpretation of the r-process nucleosynthesis and are needed in fission-like applications since theoretical models depend sensitively on the nuclear structure input. Predicated on these ideas, a dedicated decay spectroscopy experimental program has been initiated at Argonne National Laboratory, by combining the CARIBU radioactive beam facility with the newly developed Gammasphere decay station. The initial focus was on several deformed odd-odd nuclei, where β decays of both the ground state and an excited isomer were investigated. Because of the spin difference, a variety of structures in the daughter nuclei were selectively populated and characterized, which in turn provided information about the structure of the isomers. Mass measurements using the Canadian Penning Trap aimed at discovering of long-lived isomers in these regions and at determining of their excitation energies were also carried out.
Overview of the decay spectroscopy program at ANL will be presented together with results from recent experiments and comparison with multi-quasiparticle blocking calculations. The effect of K-forbiddenness on the β-decay strength will also be discussed.

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