Understanding r-process nuclei using the (d,p) reaction on exotic beams

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The first neutron-transfer measurement on a radioactive r-process nucleus, ^{82}Ge, was performed at the HRIBF. Prior to this measurement, only the half-life of ^{83}Ge was known. Important information was revealed about the ground and first excited states of ^{83}Ge, including its mass. The program of (d,p) reactions on radioactive beams was continued with a beam of ^{84}Se to extract spectroscopic information about both the ground state and low-lying excited states. These types of measurements probe the evolution of structure away from stability, which is a critical parameter in many r-process models.

We are extending our techniques to study nuclei around the doubly-magic ^{132}Sn nucleus. We have made a proof of principle study of (d,p) reactions in inverse kinematics in the A~132 region using a stable beam of ^{124}Sn.

Results from the two measurements of the N=50 shell crossing as well as our work on neutron-rich tin isotopes will be presented.

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