Single-neutron levels near the N=82 shell gap

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Nuclei with a few nucleons beyond shell closures are important in understanding the evolution of single-particle structure, which is critical to the benchmarking of nuclear models. With radioactive ion beams, studies near the double shell closure ^{132}Sn have been made possible. While the single-neutron states in ^{133}Sn with N=83 have recently been verified to be highly pure [1], it is important to study further from the N=82 closed shell. The (d,p) reaction was measured with the radioactive ion beams of ^{126}Sn and ^{128}Sn in inverse kinematics at the Holifield Radioactive Ion Beam Facility (HRIBF) at Oak Ridge National Laboratory, utilizing the SuperORRUBA silicon detector array. Angular distributions of reaction protons were measured for several states in ^{127}Sn and ^{129}Sn in order to determine angular momentum transfers and deduce spectroscopic factors. Such information is critical for calculating direct (n,γ) cross sections for the r-process and for constraining shell model parameters in the A$\sim$130 region. In addition, in order to obtain more precise energy levels, particle-gamma coincidence data were acquired for the inverse (^{9}Be,^{8}Be) reaction at the HRIBF using a HPGe and CsI array (CLARION+HyBall). Combined with previous experiments on ^{130}Sn and ^{132}Sn, these results provide a complete set of (d,p) reaction data on even tin isotopes between stable ^{124}Sn and doubly magic ^{132}Sn. This work is supported in part by the U.S. Department of Energy and National Science Foundation.

References

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