Neutron Spectroscopic Factors of ^{34}Ar and ^{46}Ar from transfer reactions

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Spectroscopic factors (SF) are fundamental quantities in nuclear physics. They have been extensively used to understand single particle properties of nuclear structure to astrophysical network calculations. A recent analysis of ground state neutron spectroscopic factors from Z=3-24, using the conventional transfer reaction analysis, indicates that spectroscopic factors from (p,d) and (d,p) reactions are remarkably consistent with large-basis shell-model calculations. Similar study of excited states for nuclei from Z=8 to 28 provides additional tests to the interactions used in the shell model. The agreement of the extracted SF factors with large-basis shell-model calculations is different from the results obtained in knockout reactions. Knockout reactions with radioactive beams suggest that the spectroscopic factors of highly bound valence nucleons are suppressed with respect to their weakly bound cousins. While choice of optical model potentials and geometries of the bound neutron wave functions may give different absolute SF values from transfer reactions, the comprehensive data obtained from transfer reactions do not yield evidence of systematic suppressions of SF with neutron binding energy. To reconcile the different behavior of the spectroscopic factors obtained in knockout and transfer reactions, (p,d) neutron transfer reactions have been studied with proton rich ^{34}Ar and neutron rich ^{46}Ar beams in inverse kinematics at NSCL with the high resolution array HiRA and the S800 spectrometer. First results from this experiment will be presented. This work is supported by the National Science Foundation under Grants PHY-0606007 and PHY 0216783.