STRUCTURE OF ^{9}C FROM THE ^{10}C(*d*,*t*)^{9}C REACTION AND THE RELIABILITY OF AB-INITIO TRANSFER FORM FACTORS

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The structure of the neutron-deficient nucleus ^{9}C is poorly known. Only a few excited states have been observed and little information exists on their single-particle characteristics. The measured ground-state magnetic dipole moment is anomalously small in comparison to the mirror nucleus ^{9}Li, suggesting possible higher order configurations in the ground state wave function. Both ^{10}C and ^{9}C are accessible via *ab-initio* calculations using modern techniques such as the Quantum Monte Carlo (QMC) approach [1]. In addition to the excitation energies in the A = 9 and 10 systems, it is possible to calculate the spectroscopic overlaps that are relevant for the neutron-removing reaction ^{10}C(*d*,*t*)^{9}C with the wave functions for both ^{9,10}C. In order to test the predictions from this and other calculations of the neutron-pickup spectroscopic factors, we have studied the ^{10}C(*d*,*t*)^{9}C reaction, in inverse kinematics. The radioactive ^{10}C beam was produced at the ATLAS In-flight facility through the *p*(^{10}B, ^{10}C)*n* reaction using a 185-MeV ^{10}B beam incident on a cryogenic H_2 gas cell. The secondary ^{10}C beam had an energy of 171 MeV and an intensity of approximately 2×10^{4} pps. The beam was incident on a 650 μg/cm^{2} deuterated polyethylene $(CD_2)_n$ target. Tritons were detected in a series of annular double sided silicon detectors covering Θ_{lab} between 8 and 42 degrees. The heavy recoils from particle-bound, or unbound states in ^{9}C were detected in a set of forward-angle silicon detectors in a ΔE-E configuration. The ground-state transition was clearly observed and angular-distribution data were extracted. The neutron-pickup spectroscopic factor was deduced from a comparison with distorted-wave Born approximation calculations, with bound-state form factors calculated either with the usual approach of calculating a *n*-^{9}C bound state in a Woods-Saxon potential, or from wave functions derived from QMC calculations. A comparison between the results using these two methods will be presented providing insight into the reliability of form factors for nucleon transfer derived from *ab-initio* approaches. Work was supported by the U. S. Department of Energy, Office of Nuclear Physics, under Contracts DE-FG02-04ER41320 and DE-AC02-06CH11357.

References

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