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The study of single-particle strength quenching effect and nuclear astrophysical $^{14}C(n,\gamma)^{15}C$ reaction using single-neutron-removal transfer reactions of ^{15}C

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Single-particle motion of nucleons is quenched by so-called short-range and long-range correlations, which was first observed on some stable nuclei through (e,e'p) and (d, ^{3}He) transfer reactions. Systematic studies of Heavy-Ion (HI) induced single-nucleon knockout at intermediate-energy have drawn a surprising conclusion that the quenching factor Rs, simply defined as the ratio of experimental cross-section and theoretical counterpart, exhibits a strong negative dependence on the Fermi surface asymmetry ΔS. Interestingly, in proton induced knockout and transfer framework, no such dependence has been found so far. However, there is only scarce data of transfer reactions on extremely weakly bound nuclei with ΔS ≤ -15 MeV, where HI induced knockout shows great discrepancy with current transfer reaction trend, so testing the quenching effect in such extreme ΔS region with different probes is crucial for understanding this longstanding issue. In this work, we analyzed the quenching factor of ^{15}C valence neutron using single-neutron-removal transfer reactions. A bridge between nuclear structure and nuclear astrophysics was constructed through this effect and radioative capture theory.

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