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Cluster folding analysis of the 13C + 12C system at energies near the Coulomb barrier

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Motivated by the cluster structure of ^{13}C, where a ^{12}C core is coupled with a neutron at an excitation energy of 4.946 MeV, we investigated the effects of single-nucleon transfer between ^{13}C and ^{12}C nuclei. The neutron stripping transfer reaction, ^{12}C(^{13}C,^{12}C)^{13}C, was studied at center-of-mass energies ($E_{c.m.}$) ranging from 7.8 to 49.14 MeV. We analyzed both elastic scattering and elastic transfer data using the optical model (OM) and the Distorted Wave Born Approximation (DWBA). The analysis incorporated a cluster folding potential, which accounts for the cluster nature of the ^{13}C nucleus-comprising a ^{12}C core with a valence neutron orbiting around it. Our results show reasonable agreement with the experimental data across the entire energy range. Furthermore, we extracted the spectroscopic amplitude for the ^{13}C->^{12}C+n configuration, and the obtained values are consistent with previously reported results.

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