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Elastic scattering measurement for the proton dripline nucleus 9C at above the Coulomb barrier energy

The proton dripline nucleus 9C, with a small two-proton separation energy of 1.43 MeV, can be considered as a two-proton halo candidate. Special attention has been recently devoted to the experimental and theoretical studies of the exotic nature of 9C [1-4]. Elastic scattering angular distributions of proton drip-line isotones 9C impinging on lead target have been measured for the first time at energies around three times of Coulomb barriers. The experiment was performed at the National Laboratory of Heavy Ion Research of the Institute of Modern Physics, Lanzhou, China. The secondary beams of radioactive isotopes were produced by the fragmentation of the 12C primary beam on a 9Be target with a thickness of 2652 m using Heavy Ion Research Facility of Lanzhou (HIRFL). The secondary, 7Be, 8B and 9C beams were separated by their magnetic rigidity and delivered by the Radioactive Ion Beam Line in Lanzhou (RIBLL). The elastic scattering events were detected using two sets of ΔE-E silicon telescopes, which consisted of a double-sided silicon strip detector (DSSD, 48 strips in 1 mm width each including a 0.1mm interval) with a thickness of 150 μm and a large surface silicon detector (SD) with a thickness of 1500 μm. The obtained elastic scattering cross sections have been normalized with the Rutherford cross sections and the resultant angular distributions have been reproduced reasonably well by the optical model calculations with the systematic nucleus-nucleus potential. In the present work, it has been observed that proton-rich nuclei 9C and 8B, do not show reduction in the elastic scattering cross sections in comparison to that of neutron rich nuclei at the present bombarding energy of measurement. Similar observation also has been made in previous experimental results for proton halo nucleus 8B, showing tiny influence from the breakup coupling [5]. This fact could be interpreted as due to the valence protons in these nuclei where the Coulomb and centrifugal barriers (if any) counteract the breakup coupling effects and the result is the absence of the Coulomb rainbow suppression for proton-rich nuclei such as 9C and 8B, in contrast to the cases of neutron-rich nuclei. Further, to elucidate the breakup coupling effects on the elastic scattering of 9C, Continuum Discretized Coupled Channels (CDCC) calculations have been performed and results have been compared with those of 8B. In the present calculations, 9C is assumed to have 8B+p and 7Be+2p configurations. The results from these two different configurations are consistent and reproduce the experimental data within the error bars, suggesting that the elastic scattering data are not sensitive to the assumed cluster structure of 9C.

References:
[1] B. Blank et al., Nucl. Phys. A 624, 242 (1997).
[2] J. Enders et al., Phys. Rev. C 67, 064301 (2003).
[3] R. E. Warner et al., Phys. Rev. C 69, 024612 (2004).
[4] T. Fukui et al., Phys. Rev. C 86, 022801 (2012)(R).
[5] Y.Y.Yang et al., Phys. Rev. C 87, 044613 (2013).

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