

A new method for derivation of the proton distribution radii through charge-changing cross sections for light-mass isotope chains

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We are attempting to derive the proton and neutron distribution radii by simultaneous measurements of the interaction cross sections and the charge-changing cross sections. The relationship between the proton distribution radius and the charge-changing cross section can be intuitively understood through geometric considerations. However, previous studies have revealed that the charge-changing cross section does not simply correspond to the proton distribution radius of the incident nucleus but also depends on the neutron distribution of the incident nucleus. Therefore, in this study, we devised a method to quantitatively evaluate the portion dependent on the neutron distribution and subtract it from the charge-changing cross section to derive the proton distribution radius. Specifically, we measured the charge-changing cross sections at ~ 170 A MeV for He, Li, and Be isotopes on several target nuclides. Proton distribution radii of both projectiles and targets are known. As a result, we found that the contribution from the portion of the charge change cross section that depends on the neutron distribution of the incident nucleus is found to be particularly large for the proton target. Utilizing this fact, we will discuss a new method to derive the proton distribution radii.

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