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Determining charge radii of exotic nuclei from charge-changing reactions

Charge-changing cross sections (CCCS) at intermediate energies have been used to determine the rms point-proton radii (R_p) for exotic nuclei. However, one key question remains: Can one get consistent charge radius results on different targets? In this talk, I will present our recent CCCS measurements of more than 60 p-sd shell nuclei on various targets at 900 and 300 MeV/nucleon. Benefiting from the large and systematic data set, we show for the first time that charge-particle evaporation after neutron removals is crucial in charge-changing reactions. We then identified a new and robust relationship between the scaling factor of the Glauber model calculations on different targets and the separation energies of the nuclei with known radii. This allows us to deduce R_p from the cross sections on hydrogen for the first time. Nearly identical R_p values are deduced from both target data for the neutron-rich carbon isotopes; however, the R_p from the hydrogen target is systematically smaller in the neutron-rich nitrogen isotopes.

Notes

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