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Determination of proton radii of neutron rich oxygen isotopes from charge-changing cross section measurements (student talk)

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Charge radius is an important bulk property of the nucleus for investigating nuclear structure. The nuclei lying close to the boundaries of the nuclear chart (the drip lines) have revealed new features like halo and skin. Another new phenomenon that has emerged in the neutron-rich region is the changing or vanishing of magic numbers [1,2]. The knowledge of proton radii is crucial for understanding the halo and skin formation and also the shell evolution in unstable nuclei. The systematic study of proton radii along an isotope chain, together with knowledge of the matter radii is important to deduce the neutron skin thickness in the neutron-rich nuclei. Furthermore, the proton radii are crucial to understand the spatial correlation between halo neutrons and its core nucleus. Proton radii also serve as a test of newly developed structure models including those based on $ab\ initio$ theory. Charge-changing cross section (σ_{cc}) is the total cross section for the change of the atomic number of the projectile nucleus. It is a unique method to extract the proton radii of neutron-rich nuclei using the Glauber model analysis. The proton radii of ^{12-17}B [3] and ^{12-19}C [4] have been successfully determined using the charge-changing cross section measurements. The neutron-rich oxygen isotopes are particularly interesting nuclei, with a new magic number (N=16) at the neutron drip line [5]. The proton radii of neutron-rich oxygen isotopes have not been measured till date. We, therefore, performed an experiment at Fragment Separator (FRS) in Germany using relativistic beams of ^{16-24}O with energy around 900 MeV/u. In this talk, I will present the preliminary results of σ_{cc} measurements of ^{16-24}O.

References

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