$^{12}C(^{12}C,^{12}C),(^{12}C,X)$ 2009Da22,2016Ka37

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu	NP A968,71 (2017)	1-Jan-2017

2009Da22: $^{12}C(^{12}C,^{12}C')$ E=120,139.5,159 MeV, analyzed elastic and inelastic $\sigma(\theta)$ using diffraction model; deduced nuclear rms radii.

2016Ka37: XUNDL dataset compiled by TUNL, 2017.

The authors carried out a systematic study of the charge changing cross sections of ≈900 MeV/A carbon isotopes on a carbon target and analyzed the data to obtain the proton and matter radii of $^{12-19}C$.

A beam of 937 MeV/A ^{12}C ions was produced by fragmenting either a 1 GeV/A ^{20}Ne beam or 1 GeV/A ^{40}Ar beam on a thick beryllium target at the GSI/FRS facility. After magnetic separation, the ^{12}C beam particles were identified event-by-event using a multi-sampling ionization chamber and the time-of-flight between two scintillators. The beam then passed through a thick carbon target before being reanalyzed in a second multi-sampling ionization chamber that measured the Z of ions after the target. In the analysis, the ratio of the charge changing events to the non-charge changing events was determined and used to obtain σ_α, the charge changing cross section. For ^{12}C, σ_α=733 mb *7* was determined.

The data were then compared with a finite-range Glauber model to obtain root-mean-square radii for the proton distribution and for the matter distribution. The results from the systematic study across $^{12-19}C$ is then compared with various models and comments are given on the development of neutron skins and neutron halos.

^{12}C Levels

E(level)	J^{π} †	Comments
0	0^+	$R^{protons}_{r.m.s.}$=2.32 fm *2*, $R^{matter}_{r.m.s.}$=2.35 fm *2* (2016Ka37). $R^{matter}_{r.m.s.}$=2.34 fm (2009Da22).
4.44×10^3		$R_{r.m.s.}$=2.36 fm *4* (2009Da22).
7.65×10^3		$R_{r.m.s.}$=2.89 fm *4* (2009Da22).
9.64×10^3		$R_{r.m.s.}$=2.88 fm *11* (2009Da22).
14.1×10^3		
18.5×10^3		
19.6×10^3		

† From Adopted Levels.