$^{12}C(^{12}C,p)$:Resonances 2018Zi03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia, Anagha Chakraborty	NDS 186, 2 (2022)	31-Mar-2022

Other: 1963Al07 from $^{12}C(^{12}C,\alpha)$ report resonance levels and suggest spins 2 and 4 for the "quasimolecular" states at 19.5- and 19.9-MeV excitation in ^{24}Mg.

2018Zi03: 3 to 7-MeV ^{12}C beam with ΔE=3 keV and energy spread of 2 keV. ^{12}C target was mounted on a water-cooled stainless-steel backing inside a target chamber at 5×10^{-9} mbar pressure. Different targets with purities of 99.997%, 99.98%, 99.95%, 99.999%, as well as pristine highly ordered pyrolytic graphite (HOPG) targets were used to find lower level of impurity and HOPG had a lower level of 0.3 ppm hydrogen impurity. Two identical ΔE-E telescopes placed at 130° to measure the proton spectra. The detectors were cooled to 0° C. For data analysis, only events with signals in both detectors were used for data analysis. Measured thick target yield. Only p_0 and p_1 proton groups were considered for data analysis to avoid interfering protons from other reactions. FWHM ≈250 keV. Deduced modified astrophysical S factors and resonance strengths.

^{24}Mg Levels

E(level)[†]	Comments
13193?	E(level): E_r=1500, a hypothetical resonance quoted in 2018Zi03. Estimated an upper limit of resonance strength $\omega\gamma(p_0+p_1)$ < 1.5 μeV (2018Zi03).
(13773 *50*)	E(level): E_r=2080 *50*, value from literature. Not identified by 2018Zi03 due to poor counting statistics, relatively large step size, and lack of data below 2000 keV. Estimated an upper limit of resonance strength $\omega\gamma(p_0+p_1)$ < 0.6 μeV and $\omega\gamma_{tot}$ < 18 μeV (2018Zi03).
≈14793[‡]	E(level): E_r=3100.
≈15093[‡]	E(level): E_r=3400.
≈15473[‡]	E(level): E_r=3780.

[†] From E_r (listed in comments section) and S(p)(^{24}Mg)=11692.69 keV *1* (2021Wa16).

[‡] Resonance energy from fit to the thick target yield data with two phenomenological partial widths and the resonance energy leading to a total of 10 fit parameters including a scaling parameter that accounts for the nonresonant contribution. An additional high-energy resonance was required to fit the thick-target yield data above 3800 keV and to account for contributions from higher lying resonances.