$^{13}C(^{11}B,^{7}Li)$ 2012Gu18,2017Me04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. G. Sheu, J. H. Kelley, J. Purcell	ENSDF	5-Aug-2021

2012Gu18: The angular distribution for the reaction $^{13}C(^{11}B,^{7}Li)^{17}O$ was measured at the HI-13 tandem accelerator of the China Institute of Atomic Energy in Beijing. A beam of E(^{11}B)=50 MeV impinged on a self-supporting ^{13}C target (75 *6* μg/cm^2, 8% purity). The reaction products were separated by a Q3D magnetic spectrograph and detected by a two-dimensioanl position-sensitive Si detector PSSD.

Excitation states of ^{17}O*(3.055,3.843,4.554,6.356 MeV) were observed. The α-spectroscopic factor S_α=0.37 *12*, the square of the Coulomb modified ANC (asymptotic normalization coefficient), C^2 or ANC^2=4.0 fm^{-1} *11*, and the reduced α-width γ^2_α=12.7 keV for the ^{17}O*(6.356 MeV; 1/2$^+$) subthreshold state were deduced.

2017Me04: XUNDL dataset compiled by TUNL, 2017.

The authors measured the angular distributions of $^{11}\beta^+$ ^{13}C elastic and inelastic scattering and deduced α spectroscopic factors of ^{17}O states.

A beam of 45 MeV ^{11}B ions, from the Warsaw cyclotron facility, impinged on a carbon foil target (90% ^{13}C). The reaction products were detected at $\theta_{cm}\approx12°-175°$ using ΔE-E telescopes. The $^{11}\beta^+$ ^{13}C elastic and inelastic scattering to ^{17}O states with E_x=(0,871,3055,3843,4554,6356) were observed.

The data were analyzed using optical model (OM) and the coupled-channels Born approximation (CCBA) calculations. The α spectroscopic factors of the ^{17}O states were determined. The largest value was for the subthreshold 1/2$^+$ state at E_x=6.356 MeV, either S_α=0.72±0.22 (N=3) or S_α=0.39±0.12 (N=4). The number N is the number of nodes in the α particle radial wave function, not counting the one at the origin (2003Ke10,2008Pe09).

Enhancements were observed in the backward angle scattering for reactions to ^{17}O*(0,871,3055,3843). The authors explored the exotic ^{6}Li cluster transfer mode as an explanation but were still unable to explain the effect.

See also (2018Ke03: theory).

^{17}O Levels

E(level)†	J$^\pi$†	S_α‡	Comments
0	5/2$^+$	0.08 *2*	
871	1/2$^+$	0.35 *12*	
3055	1/2$^-$	0.42 *16*	S_α: =0.19 *6* (2012Gu18).
3843	5/2$^-$	0.10 *3*	S_α: =0.078 *25* (2012Gu18).
4554	3/2$^-$	0.15 *5*	S_α: =0.060 *19* (2012Gu18).
6356	1/2$^+$	0.39 *12*	S_α: for N=4; ANC^2=4.5 fm^{-1} *14*. For N=3, S_α=0.72 *22*; ANC^2=5.1 fm^{-1} *15* (2017Me04). S_α=0.37 *12*; ANC^2=4.0 fm^{-1} *11* (2012Gu18).

† Nominal level energy and J$^\pi$ values listed in (2017Me04).

‡ From (2017Me04).