C(^{44}S,^{42}Siγ) 2012Ta20

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen[#] and Balraj Singh	NDS 135, 1 (2016)	31-May-2016

Two-proton removal reaction.

2012Ta20: E=385 MeV/nucleon ^{48}Ca primary beam with an average intensity of 70 pnA was produced at the RIBF facility at RIKEN and incident on a 15-mm-thick rotating beryllium target. A secondary ^{44}S beam was analyzed by the BigRIPS fragment separator and accelerated to an energy of 210 MeV/nucleon with an intensity of 4×10^4 pps. The secondary target was a 2.54 g/cm^2 carbon foil. Reaction products were analyzed by the ZeroDegree spectrometer and identified using the energy loss (ionization chamber), magnetic rigidity and time-of-flight (plastic scintillators); γ rays were detected by the DALI2 array of 186 NaI(Tl) detectors surrounding the reaction target (20% efficiency, FWHM=10% at Eγ=1 MeV). Measured Eγ, Iγ, particle-γ-coin. Deduced levels, J^π, rapid deformation development of Si isotopes. Comparison with shell-model calculations.

Additional information 1.

Total cross section for ^{42}Si=0.12 mb *2* for E=210 MeV/nucleon.

^{42}Si Levels

E(level)[†]	J$^\pi$[‡]	Comments
0	0^+	
742 *8*	2^+	
2173? *14*	(4^+)	E(level): this level is tentatively assigned by 2012Ta20 based on $\gamma\gamma$-coin as the first 4^+ state predicted by shell-model calculations. The resulting energy ratio between the first 4^+ and 2^+ states ($R_{4/2}$)=2.93 *5* is close to the rigid-rotor limit, which contradicts the possibility of a doubly closed structure suggested by the two magic numbers Z=14 and N=28 but supports enhanced quadrupole collectivity. Furthermore, large $R_{4/2}$ value indicates a significant static ground state deformation of ^{42}Si (2012Ta20).
2774? *12*		

[†] From Eγ.
[‡] Predicted by shell-model calculations.

γ(^{42}Si)

E$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
742 *8*	742	2^+	0	0^+	
1431 *11*	2173?	(4^+)	742	2^+	E$_\gamma$: placement of this γ-ray is based on $\gamma\gamma$-coin with the 742 γ-ray. Also yield of this γ-ray is consistent with 100% feeding of the (2^+) state.
2032[†] *9*	2774?		742	2^+	E$_\gamma$: possible partial feeding of the 2^+ state at 742 keV (2012Ta20).
[x]2357 *15*					

[†] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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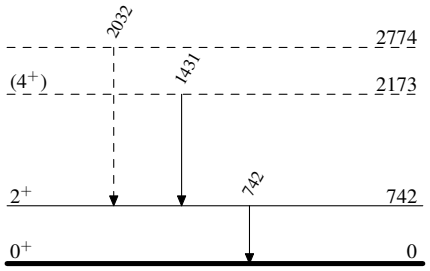
Level Scheme

Legend

γ Decay (Uncertain)



$^{42}_{14}Si_{28}$