$^{2}H(^{57}Cu,^{58}Zn\gamma)$ 2014La16

(d,n) proton-transfer reaction in inverse kinematics.

2014La16: E(^{57}Cu)=75 MeV/nucleon produced in ^{9}Be(^{58}Ni,X) reaction at 160 MeV/nucleon using NSCL-MSU Coupled Cyclotron facility. The radioactive ^{57}Cu beam was separated using A1900 separator and ΔE-Bρ-Bρ technique. Secondary target=225 mg/cm^2 CD_2. ^{58}Zn fragments were identified by ΔE-position-TOF detectors placed in focal plane of S800 spectrograph. Measured Eγ, Iγ, (^{58}Zn ions)γ-coin, γγ-coin using GRETINA array. Deduced levels, J, π, proton resonance energies. Comparison with shell-model and Coulomb-shift calculations, and with structure of mirror nucleus ^{58}Ni. Calculated astrophysical reaction rates for ^{57}Cu(p,γ)^{58}Zn reaction.

S(p)(^{58}Zn)=2280 *50* (2012Wa38).

^{58}Zn Levels

E(level)†	Jπ‡	Comments
0.0	0^+	
1356 *3*	(2^+)	
2499 *4*	(4^+)	E(p)(resonance)=219 *50*.
2609 *6*	(2^+)	E(p)(resonance)=329 *50*.
2862 *3*	(2^+)	E(p)(resonance)=581 *50*.
2902 *3*	(1^+)	E(p)(resonance)=624 *50*.
3263 *4*	(2^+)	E(p)(resonance)=985 *50*.
3378 *6*	(3^+)	E(p)(resonance)=1098 *50*.

† From least-squares fit to Eγ data. All levels listed here above the first 2^+ level at 1356 keV are proton unbound.

‡ From systematics of even-even nuclei, shell-model predictions, and mirror analogy with ^{58}Ni nucleus.

γ(^{58}Zn)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f
879 *4*	4 *1*	3378	(3^+)	2499	(4^+)
1143 *3*	62 *6*	2499	(4^+)	1356	(2^+)
1253 *5*	7 *2*	2609	(2^+)	1356	(2^+)
1356 *3*	100 *5*	1356	(2^+)	0.0	0^+
1507 *4*	8 *2*	2862	(2^+)	1356	(2^+)
1545 *3*	13 *2*	2902	(1^+)	1356	(2^+)
1906 *4*	4 *2*	3263	(2^+)	1356	(2^+)
2861 *4*	7 *2*	2862	(2^+)	0.0	0^+
2904 *5*	3 *1*	2902	(1^+)	0.0	0^+
3265 *6*	7 *2*	3263	(2^+)	0.0	0^+

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Level Scheme

Intensities: Relative I_γ