^{70}Ni β^- decay 2004Va08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. Gürdal, E. A. Mccutchan	NDS 136, 1 (2016)	1-Jul-2016

Parent: ^{70}Ni: E=0.0; $J^\pi=0^+$; $T_{1/2}$=6.0 s *3*; Q(β^-)=3762.5 *24*; %β^- decay=100.0

^{70}Ni activity produced in proton-induced fission of natural uranium, with E(p)=30 MeV. Fission fragments first thermalized and neutralized in a buffer gas then selectively extracted through resonant laser ionization and electromagnetic separation using the LISOL separator. Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$, and γ(t) using two HPGe detectors and a thin plastic ΔE scintillator. Subset of results presented in 2004Va07. See also 2002VaZX, thesis.

A total energy release of 3520 keV *180* is calculated for this decay scheme using the RADLST code, which can be compared to the total Q value of 3762.5 keV *24*. Due to the ≈1.8 MeV gap in energy between the highest observed excited level and the Q value and also the approximation that has gone into the normalization of the decay scheme, beta-decay feeding intensities and log *ft* values should be considered approximate.

α: Additional information 1.

α: Additional information 2.

^{70}Cu Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0.0	6^-	44.5 s *2*	
101.1 *3*	3^-	33 s *2*	E(level): confirmed in high-precision mass measurement where 100.7 keV *26* was deduced (2004Va07).
228.5 *4*	4^-		
242.6 *5*	1^+	6.6 s *2*	E(level): confirmed in high-precision mass measurement where 242.0 keV *27* was deduced (2004Va07).
320.7 *5*	(2^+)		
368.9 *5*	(2^-)		
628.1?			
697.7 *5*	(1^+)		
706.4?			
938.8 *5*			
1278.4 *5*	(1^+)		
1520.4 *5*	(1^+)		
1980.1 *6*	(1^+)		

† From a least-squares fit to Eγ, by the evaluators.

‡ From the Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-†	Log *ft*	Comments
(1782.4 *25*)	1980.1	≈1.2	≈4.8	av Eβ=711.3 *12*
(2242.1 *25*)	1520.4	≈4.6	≈4.6	av Eβ=924.9 *12*
(2484.1 *25*)	1278.4	≈17	≈4.2	av Eβ=1038.8 *12*
(3064.8 *25*)	697.7	≈5.7	≈5.1	av Eβ=1315.0 *12*
(3519.9 *25*)	242.6	≈71	≈4.3	av Eβ=1533.4 *12*

Iβ^-: from comparison of observed total activities of ^{70}Ni parent with the 6.6-s ^{70}Cu daughter activities (2004Va08). The latter was derived using absolute Iγ(885γ)=94% *2* from 6.6-s ^{70}Cu 1^+ decay and assuming no ground state β feeding in the 6.6-s ^{70}Cu 1^+ decay.

† Absolute intensity per 100 decays.

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$\gamma(^{70}Cu)$

Iγ normalization: from Σ(I(γ+ce) to 243- and 101-keV isomers)=29%. %Iβ to 242-keV level = 71 was derived by 2004Va08 from comparison of observed total activities of ^{70}Ni parent with the 6.6-s ^{70}Cu daughter activities. The latter was derived using absolute Iγ(885γ)=94% *2* from 6.6-s ^{70}Cu 1$^+$ decay and assuming no ground state β feeding in the 6.6-s ^{70}Cu 1$^+$ decay.

E_γ[†]	I_γ[†@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α	Comments
78.3 *1*	34 *5*	320.7	(2$^+$)	242.6	1$^+$	[M1]	0.1042	α(K)=0.0931 *14*; α(L)=0.00968 *14*; α(M)=0.001362 *20*; α(N)=4.02×10^{-5} *6*
126.5 *2*	4 *3*	368.9	(2$^-$)	242.6	1$^+$	[E1]	0.0270	α(K)=0.0242 *4*; α(L)=0.00241 *4*; α(M)=0.000336 *5*; α(N)=9.78×10^{-6} *15*
127.4 *2*	3.3 *18*	228.5	4$^-$	101.1	3$^-$	[M1]	0.0281	α(K)=0.0252 *4*; α(L)=0.00258 *4*; α(M)=0.000364 *6*; α(N)=1.084×10^{-5} *16*
140.4 *6*	2.9 *16*	368.9	(2$^-$)	228.5	4$^-$	[E2]	0.169 *4*	α(K)=0.150 *4*; α(L)=0.0166 *4*; α(M)=0.00230 *5*; α(N)=5.96×10^{-5} *13*
232.8[#&] *3*	2.0 *13*	938.8		706.4?				
267.8 *4*	3.6 *7*	368.9	(2$^-$)	101.1	3$^-$	[M1]	0.00426	α(K)=0.00382 *6*; α(L)=0.000385 *6*; α(M)=5.42×10^{-5} *8*; α(N)=1.639×10^{-6} *24*
339.6 *1*	25 *4*	1278.4	(1$^+$)	938.8				
377.2 *1*	21 *4*	697.7	(1$^+$)	320.7	(2$^+$)			
385.7[#&] *5*	9.6 *16*	628.1?		242.6	1$^+$			
385.7[#&] *5*	2.0 *13*	706.4?		320.7	(2$^+$)			
455.1 *1*	27 *4*	697.7	(1$^+$)	242.6	1$^+$			
581.1 *2*	3.5 *9*	1278.4	(1$^+$)	697.7	(1$^+$)			
618.4 *2*	14 *4*	938.8		320.7	(2$^+$)			
650.1[#&] *2*	9.6 *16*	1278.4	(1$^+$)	628.1?				
696.1 *1*	10.1 *16*	938.8		242.6	1$^+$			
956.9 *3*	2.8 *15*	1278.4	(1$^+$)	320.7	(2$^+$)			
1035.6 *2*	100 *7*	1278.4	(1$^+$)	242.6	1$^+$			
1152.3 *4*	6 *3*	1520.4	(1$^+$)	368.9	(2$^-$)	[E1]	1.14×10^{-4}	α(K)=7.98×10^{-5} *12*; α(L)=7.83×10^{-6} *11*; α(M)=1.100×10^{-6} *16*; α(N)=3.37×10^{-8} *5*
1277.6 *2*	30 *5*	1520.4	(1$^+$)	242.6	1$^+$			
1611.2 *3*	9 *2*	1980.1	(1$^+$)	368.9	(2$^-$)	[E1]	3.95×10^{-4}	α(K)=4.51×10^{-5} *7*; α(L)=4.41×10^{-6} *7*; α(M)=6.20×10^{-7} *9*; α(N)=1.90×10^{-8} *3*

[†] From 2004Va08. Iγ are given relative to Iγ(1036γ)=100.
[‡] From the Adopted Levels.
[#] Ordering of the 650γ-386γ cascade and the 233γ-386γ cascade could not be determined. A reverse ordering resulting in the 628-keV level moving to 892.5 keV and the 706-keV level moving to 553.5-keV is also possible.
[@] For absolute intensity per 100 decays, multiply by ≈0.129.
[&] Placement of transition in the level scheme is uncertain.

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Decay Scheme

Intensities: I_γ per 100 parent decays