^{98}Cd ε decay (9.3 s) 1992Pl01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

Parent: ^{98}Cd: E=0.0; J$^{\pi}$=0^{+}; $T_{1/2}$=9.3 s *1*; Q(ε)=5430 *40*; %ε+%β^{+} decay=100.0
^{98}Cd-$T_{1/2}$: From ^{98}Cd Adopted Levels.
^{98}Cd-Q(ε): From 2017Wa10.
1992Pl01: ^{98}Cd source was produced by spallation of a natural tin target with 600 MeV protons from the ISOLDE facility. Conversion electrons were detected with a mini-orange electron spectrometer and γ and X rays were detected with Ge detectors. Measured Eγ, Iγ, γγ-coin, γX-coin, γ(t), E(ce), I(ce), (ce)γ-coin. Deduced levels, J, π, parent $T_{1/2}$, decay branching ratios, log*ft*. Comparisons with theoretical calculations.
2017Pa35: activity of ^{98}Cd was produced via ^{9}Be(^{124}Xe,Xγ). 107, 61 and 347 gamma rays were seen, and the ordering of the 107-61γ cascade was re-investigated and reversed from the one proposed by 1992Pl01.
2019Lu08: from β(1176γ)-coin, measured Q($\beta^{+)value=2.79MeV 8 to 1691 level in ^{98}Ag from\ ^{98}Cd \varepsilon decay}$.
Other: 1978El09.
Due to a large gap between Q-value and excitation energy of the highest observed level (possible pandemonium effect), the decay scheme could be incomplete and the deduced decay branching ratios and log*ft* values could be considered as approximated.

^{98}Ag Levels

E(level)[†]	J$^{\pi}$[‡]	$T_{1/2}$[‡]
0.0	(6^{+})	47.5 s *3*
107.28 *10*	(4^{+})	161 ns *7*
167.83 *15*	(3^{+})	
514.99 *17*	(2^{+},3^{+})	
1066.43 *24*	(2,3^{+})	
1290.6 *4*	(1^{+})	
1691.14 *23*	1^{+}	
1861.1 *5*	1^{+}	
2164.9 *5*	1^{+}	
2544.4 *8*	1^{+}	

† From a least-squares fit to γ-ray energies.
‡ From Adopted Levels.

ε,β^{+} radiations

E(decay)	E(level)	Iβ^{+} ‡	Iε‡	Log *ft*	I(ε+β^{+})†‡	Comments
(2.89×10^{3} *4*)	2544.4	1.6 *4*	1.1 *3*	4.2 *1*	2.7 *7*	av Eβ=832 *19*; εK=0.362 *15*; εL=0.0456 *19*; εM+=0.0113 *5*
(3.27×10^{3} *4*)	2164.9	5.7 *9*	2.3 *4*	4.0 *1*	8.0 *12*	av Eβ=1006 *19*; εK=0.249 *10*; εL=0.0313 *13*; εM+=0.0077 *4*
(3.57×10^{3} *4*)	1861.1	5.0 *8*	1.4 *2*	4.3 *1*	6.4 *10*	av Eβ=1147 *19*; εK=0.186 *8*; εL=0.0234 *9*; εM+=0.00578 *23*
(3.74×10^{3} *4*)	1691.14	64 *3*	14 *1*	3.29 *4*	78 *4*	av Eβ=1226 *19*; εK=0.159 *6*; εL=0.0200 *8*; εM+=0.00494 *19*
(4.14×10^{3} *4*)	1290.6	3.0 *13*	0.44 *20*	4.9 *2*	3.4 *15*	av Eβ=1413 *19*; εK=0.112 *4*; εL=0.0141 *5*; εM+=0.00347 *12*

† Deduced by evaluators from I(γ+ce) intensity imbalance at each level.
‡ Absolute intensity per 100 decays.

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γ(^{98}Ag)

Iγ normalization: From I(γ+ce to 168 level)=100, assuming 33% uncertainty in Iγ if not given. %εp<0.025 for ^{98}Cd decay from Adopted Levels of ^{98}Cd. Due to possible pandemonium effect, the decay scheme could be incomplete and thus the normalization could be considered as approximated.
Additional information 1.

$E_γ$[†]	$I_γ$[†&]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Mult.[@]	α[a]	Comments
60.55[‡] *10*	45.0 *20*	167.83	(3$^+$)	107.28	(4$^+$)	M1	1.76	%Iγ=35.1 *19* α(K)exp=1.80 *14* (1992Pl01) α(K)=1.80 *15*; α(L)=0.35 *9*; α(M)=0.069 *17* α(N)=0.011 *3*; α(O)=0.000318 *17* Mult.,δ: from α(K)exp. Note that Mult=M1+E2 with δ(E2/M1)=0.27 *8* deduced from α(K)exp=1.80 *4* would give a larger $α_T$=2.23, resulting in a total (γ+ce) intensity much greater than that of 107γ, which is expected to be equal.
107.28[‡] *10*	56.0 *14*	107.28	(4$^+$)	0.0	(6$^+$)	E2	1.125	%Iγ=43.7 *16* α(K)exp=0.82 *9* (1992Pl01) α(K)=0.870 *13*; α(L)=0.208 *3*; α(M)=0.0407 *6* α(N)=0.00657 *10*; α(O)=0.0001267 *19* Mult.: from α(K)exp with δ(E2/M1)>1.75.
347.18 *10*	100	514.99	(2$^+$,3$^+$)	167.83	(3$^+$)	(M1)	0.015	%Iγ=78.1 *21* α(K)=0.01307 *19*; α(L)=0.001568 *22*; α(M)=0.000298 *5* α(N)=5.16×10^{-5} *8*; α(O)=2.43×10^{-6} *4* Mult.: proposed by 1992Pl01 but no experimental evidence is given.
551.7 *3*	4.3 *6*	1066.43	(2,3$^+$)	514.99	(2$^+$,3$^+$)			%Iγ=3.4 *5*
624.9 *3*	10.5 *15*	1691.14	1$^+$	1066.43	(2,3$^+$)			%Iγ=8.2 *11*
775.6 *4*	6.0 *15*	1290.6	(1$^+$)	514.99	(2$^+$,3$^+$)			%Iγ=4.7 *12*
794.7 *4*	6.2 *12*	1861.1	1$^+$	1066.43	(2,3$^+$)			%Iγ=4.8 *10*
874.5 *5*	4.3 *8*	2164.9	1$^+$	1290.6	(1$^+$)			%Iγ=3.4 *7*
898.5 *3*	16 *3*	1066.43	(2,3$^+$)	167.83	(3$^+$)			%Iγ=12.5 *21*
1098 *1*	3.0 *10*	2164.9	1$^+$	1066.43	(2,3$^+$)			%Iγ=2.3 *8*
1124 *1*	2.7 *9*	1290.6	(1$^+$)	167.83	(3$^+$)			%Iγ=2.1 *7*
1176.1 *2*	85 *3*	1691.14	1$^+$	514.99	(2$^+$,3$^+$)			%Iγ=66 *3*
1346 *1*	2.0 *3*	1861.1	1$^+$	514.99	(2$^+$,3$^+$)			%Iγ=1.56 *24*
1523.0 *5*	4.4 *10*	1691.14	1$^+$	167.83	(3$^+$)			%Iγ=3.4 *8*
1650[#] *1*	1.0 *3*	2164.9	1$^+$	514.99	(2$^+$,3$^+$)			%Iγ=0.78 *24*
1996.5[#] *10*	2.0 *7*	2164.9	1$^+$	167.83	(3$^+$)			%Iγ=1.6 *6*
2030[#] *1*	2.0 *7*	2544.4	1$^+$	514.99	(2$^+$,3$^+$)			%Iγ=1.6 *6*
[x]2229.5[#] *10*	≤4.0							%Iγ≤3.2
2376[#] *1*	1.5 *5*	2544.4	1$^+$	167.83	(3$^+$)			%Iγ=1.2 *4*

[†] From 1992Pl01, unless otherwise noted. Quoted values of intensities from 1992Pl01 are the original values divided by a factor of 10.
[‡] The ordering of 107γ and 61γ is from 2017Pa35, based on the non-observation of 61γ in their time-delayed spectrum. 1992Pl01 had proposed a reversed ordering, defining the intermediate level at 60.55 keV, instead of the present 107 keV. Note that the ordering by 1992Pl01 is based on γγ-coin spectra accumulated for 26 hours.

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γ(^{98}Ag) (continued)

[#] Observed only in $\gamma\gamma$-coin with summed spectra for gates on 61γ, 107γ, 347γ and also in coincidence with Ag K X rays (1992Pl01).

[@] From I(ce)/Iγ relative to those for 59γ, 97γ, 98γ, 111γ, 116γ, 125γ and 140γ from ^{101}Cd, ^{102}Cd and ^{103}Cd, unless otherwise noted. The same values are adopted in Adopted Gammas.

[&] For absolute intensity per 100 decays, multiply by 0.781 *21*.

[a] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[x] γ ray not placed in level scheme.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays