^{197}Pb ε decay (8 min) 1979CoZI

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Huang Xiaolong, Zhou Chunmei	NDS 104, 283 (2005)	1-Jan-2002

Parent: ^{197}Pb: E=0.0; $J^\pi=3/2^-$; $T_{1/2}$=8 min *2*; Q(ε)=3592 *17*; %ε+%$β^+$ decay=100.0

Others: 1972Ho09, 1974Ne16, 1979Ra04, 1980Hi04.

Sources produced by Re(^{16}O,X) (1979CoZI,1989MeZZ), ^{197}Au(^{6}Li,xn).

Measured Eγ, Iγ, γγ-coin. and α(K)exp with Ge(Li) and Si(Li), respectively. Shell model analysis.

Source: E(^{16}O)≈120 MeV on natural rhenium target for ≈50 min; on-line ms; mixed 8 min + 44 min activity close to equilibrium (1979CoZI).

Approximate level intensity balance obtained for partial decay scheme; see drawings.

^{197}Tl Levels

E(level)†‡	J^π#	Comments
0.0	$1/2^+$	
385.77 *6*	$3/2^+$	
761.17 *5*	$5/2^+$	Branching: Iγ(761γ)/Iγ(375γ)=0.60 *13* (1972Ho09), 1.0 *1* (1979CoZI), 0.52 *15* (1980Hi04).
1155.96 *8*	$3/2^+$	
1257.38 *12*	$1/2^-$,$3/2^-$,$5/2^-$	
1281.82 *7*	$3/2^+$,$5/2^+$	
1605.18 *10*	$(1/2^+,3/2^+,5/2^+)$	
1647.01 *8*	$3/2^+$,$5/2^+$	
1662.93 *10*	$3/2^+$,$5/2^+$	
1674.63 *8*	$3/2^+$,$5/2^+$	
1849.33 *12*	$(1/2^+,3/2^+,5/2^+)$	
1854.02 *8*	$(1/2^+,3/2^+,5/2^+)$	
1970.16 *12*	$(3/2^+,5/2^+)$	
2072.66 *22*		
2345.57 *7*	$(3/2^+,5/2^+)$	
2429.39 *9*	$1/2,3/2,5/2^{(+)}$	

† Five tentative states in 2-MeV region suggested by 1979CoZI.

‡ From decay scheme and γ′s by using least-squares fit to data.

From Adopted Levels.

ε,$β^+$ radiations

E(decay)	E(level)	Iβ+ †‡#	Iε†‡#	Log *ft*	I(ε+β+)#	Comments
(1163 *17*)	2429.39		2.8 *7*	5.83 *16*	2.8 *7*	εK=0.7945 *4*; εL=0.15471 *24*; εM+=0.05074 *10*
(1246 *17*)	2345.57		6.9 *17*	5.50 *16*	6.9 *17*	εK=0.7960 *3*; εL=0.15363 *21*; εM+=0.05032 *8*
(1519 *17*)	2072.66		1.1 *3*	6.48 *17*	1.1 *3*	εK=0.7991 *2*; εL=0.1509 *2*; εM+=0.04926 *6*
(1622 *17*)	1970.16	0.0031 *8*	2.1 *5*	6.26 *15*	2.1 *5*	av Eβ=291.4 *76*; εK=0.7995; εL=0.1500 *2*; εM+=0.04893 *6*
(1738 *17*)	1854.02	0.028 *7*	9.5 *23*	5.67 *16*	9.5 *23*	av Eβ=342.8 *75*; εK=0.79938 *9*; εL=0.1491 *2*; εM+=0.04857 *6*
(1743 *17*)	1849.33	0.0064 *16*	2.1 *5*	6.33 *15*	2.1 *5*	av Eβ=344.9 *75*; εK=0.79936 *9*; εL=0.1491 *2*; εM+=0.04856 *6*
(1917 *17*)	1674.63	0.068 *17*	10.0 *24*	5.73 *15*	10.1 *24*	av Eβ=421.7 *75*; εK=0.7976 *3*; εL=0.14758 *15*; εM+=0.04802 *6*
(1929 *17*)	1662.93	0.038 *10*	5.3 *13*	6.02 *16*	5.3 *13*	av Eβ=426.8 *75*; εK=0.7974 *3*; εL=0.14747 *16*; εM+=0.04798 *6*
(1945 *17*)	1647.01	0.091 *24*	12 *3*	5.67 *16*	12.1 *31*	av Eβ=433.8 *75*; εK=0.7972 *3*; εL=0.14733 *16*; εM+=0.04793 *6*
(1987 *17*)	1605.18	0.038 *11*	4.3 *12*	6.14 *17*	4.3 *12*	av Eβ=452.1 *75*; εK=0.7964 *4*; εL=0.14695 *16*;

Continued on next page (footnotes at end of table)

^{197}Pb ε decay (8 min) 1979CoZI (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ †‡#	Iε †‡#	Log *ft*	I(ε+β+)#	Comments
						εM+=0.04780 *6*
(2310 *17*)	1281.82	0.14 *5*	5.6 *20*	6.16 *19*	5.7 *20*	av Eβ=593.6 *75*; εK=0.7861 *8*; εL=0.14354 *21*; εM+=0.04661 *7*
(2335 *17*)	1257.38	0.13 *4*	5.0 *14*	6.21 *17*	5.1 *14*	av Eβ=604.3 *75*; εK=0.7849 *8*; εL=0.14325 *22*; εM+=0.04651 *8*
(2436 *17*)	1155.96	0.29 *7*	8.6 *21*	6.01 *16*	8.9 *22*	av Eβ=648.7 *75*; εK=0.7798 *10*; εL=0.14194 *23*; εM+=0.04606 *8*
(2831 *17*)	761.17	0.46 *16*	6.2 *21*	6.29 *19*	6.7 *23*	av Eβ=822.0 *75*; εK=0.7517 *15*; εL=0.1357 *4*; εM+=0.04397 *11*
(3206 *17*)	385.77	0.9 *4*	7 *3*	6.35 *20*	7.9 *30*	av Eβ=987.7 *76*; εK=0.7134 *20*; εL=0.1280 *4*; εM+=0.04145 *13*
(3592 *17*)	0.0	1.78 *SY*	8.22 *SY*	6.4 *SY*	10.0 *SY*	av Eβ=1159.3 *76*; εK=0.6645 *24*; εL=0.1187 *5*; εM+=0.03839 *15*
						Iε,Iβ+: estimated from systematics.

† From β+/ε theoretical calculation and γ-ray intensity imbalance, except Iε+Iβ+(to g.s.)≈10 from systematics.
‡ For absolute intensity per 100 decays, multiply by 1.0.
# Absolute intensity per 100 decays.

γ(^{197}Tl)

Iγ normalization: Assumed %ε+%β$^+$ (to g.s.)≈10% from systematics.
α(K)exp=ce(K)/Iγ normalized to α(K)(695.6γ)=0.0103 (E2 theory).

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[‡]	α[@]	Comments
375.48 *10*	14.2 *11*	761.17	5/2$^+$	385.77	3/2$^+$	M1		0.2219	α(K)= 0.1818; α(L)= 0.0307; α(M)=0.00713; α(N+..)=0.00228 α(K)exp=0.18 *4*. Other: 0.22 (1972Ho09).
385.85 *10*	56 *CA*	385.77	3/2$^+$	0.0	1/2$^+$	M1+E2	+1.7 *3*	0.094 *13*	α(K)= 0.070 *11*; α(L)= 0.0180 *12*; α(M)=0.00437 *25*; α(N+..)=0.00140 *8* I_γ: at equilibrium Iγ=350 *27* minus Iγ=294 via 43 min ^{197}Pb ε decay. δ=+1.7 *3* (0.54-s IT decay).
394.74 *15*	2.3 *5*	1155.96	3/2$^+$	761.17	5/2$^+$	M1		0.1940	α(K)= 0.1590; α(L)= 0.0268; α(M)=0.00623; α(N+..)=0.00200 α(K)exp=0.18 *6*.
520.70 *11*	1.57 *18*	1281.82	3/2$^+$,5/2$^+$	761.17	5/2$^+$	M1		0.0935	α(K)= 0.0765; α(L)=0.01273 α(K)exp=0.072 *18*.
[x]538.8 *5*	0.27 *13*								
761.14 *10*	14.8 *12*	761.17	5/2$^+$	0.0	1/2$^+$	E2		0.01111	α(K)=0.00860; α(L)=0.00189 α(K)exp=0.0070 *15*.
769.84 *18*	2.8 *4*	1155.96	3/2$^+$	385.77	3/2$^+$	M1		0.0338	α(K)= 0.0277; α(L)=0.00457 α(K)exp=0.028 *8*.
815.28 *19*	1.19 *17*	2072.66		1257.38	1/2$^-$,3/2$^-$,5/2$^-$				α(K)exp<0.014.
844.18 *11*	2.9 *3*	1605.18	(1/2$^+$,3/2$^+$,5/2$^+$)	761.17	5/2$^+$	(E2)		0.00898	α(K)=0.00704; α(L)=0.00146 Mult.: consistent with α(K)exp upper limit; π(initial)=π(final) precludes E1. α(K)exp<0.0074.
871.61 *10*	6.8 *5*	1257.38	1/2$^-$,3/2$^-$,5/2$^-$	385.77	3/2$^+$	E1		0.00310	α(K)=0.00258; α(L)=0.00039 α(K)exp=0.0018 *12*.
885.43 *20*	1.0 *2*	1647.01	3/2$^+$,5/2$^+$	761.17	5/2$^+$	M1(+E2)	0.6 *+40−6*	0.020 *11*	α(K)= 0.016 *9*; α(L)= 0.0027 *13* Additional information 3. α(K)exp=0.016 *9*.
896.09 *10*	5.6 *14*	1281.82	3/2$^+$,5/2$^+$	385.77	3/2$^+$	E2(+M1)	≥1.3	0.011 *4*	α(K)= 0.009 *3*; α(L)= 0.0017 *4* Additional information 2. I_γ: via γγ-coin; Iγ(8 min)/Iγ(43 min)=1.8 *6*. Doublet α(K)exp=0.009 *3*.
901.68 *11*	3.5 *4*	1662.93	3/2$^+$,5/2$^+$	761.17	5/2$^+$	M1		0.02257	α(K)=0.01854; α(L)=0.00304 I_γ: ^{197}Hg fraction subtracted. α(K)exp=0.018 *6*.
913.45 *14*	2.4 *3*	1674.63	3/2$^+$,5/2$^+$	761.17	5/2$^+$	M1		0.02184	α(K)=0.01794; α(L)=0.00294 α(K)exp=0.019 *5*.

$^{197}_{81}Tl_{116}$-3

^{197}Pb ε decay (8 min) 1979CoZI (continued)

γ(^{197}Tl) (continued)

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[‡]	α[@]	Comments
[x]1003.83 *12*	1.8 *2*								α(K)exp≤0.0066.
1063.77 *11*	0.7 *4*	2345.57	(3/2$^+$,5/2$^+$)	1281.82	3/2$^+$,5/2$^+$				I_γ: from γγ-coin; Iγ(43 min)/Iγ(8 min)≈4.
1088.16 *11*	2.32 *20*	1849.33	(1/2$^+$,3/2$^+$,5/2$^+$)	761.17	5/2$^+$	(E2)		0.00543	α(K)=0.00436; α(L)=0.00081 α(K)exp=0.0037 *32*.
1092.82 *11*	3.7 *3*	1854.02	(1/2$^+$,3/2$^+$,5/2$^+$)	761.17	5/2$^+$	(E2)		0.00539	α(K)=0.00432; α(L)=0.00080 α(K)exp=0.0051 *31*.
[x]1140.06 *11*	2.1 *2*								α(K)exp=0.0043 *43*.
1147.57 *15*	0.78 *10*	2429.39	1/2,3/2,5/2$^{(+)}$	1281.82	3/2$^+$,5/2$^+$				
1156.09 *10*	4.2 *3*	1155.96	3/2$^+$	0.0	1/2$^+$	M1(+E2)	0.6 *+11−6*	0.010 *4*	α(K)= 0.008 *3*; α(L)= 0.0014 *5* Additional information 1. α(K)exp=0.0084 *30*.
1208.99 *11*	2.26 *21*	1970.16	(3/2$^+$,5/2$^+$)	761.17	5/2$^+$	(M1)		0.01071	α(K)=0.00881; α(L)=0.00143 α(K)exp=0.018 *4*.
1219.21 *12*	1.86 *19*	1605.18	(1/2$^+$,3/2$^+$,5/2$^+$)	385.77	3/2$^+$	(M1)		0.01048	α(K)=0.00862; α(L)=0.00140 α(K)exp=0.011 *6*.
1261.23 *10*	9.2 *7*	1647.01	3/2$^+$,5/2$^+$	385.77	3/2$^+$	M1(+E2)	1.2 *+12−6*	0.0064 *18*	α(K)= 0.0052 *15*; α(L)=0.00087 *23* Additional information 4. α(K)exp=0.0053 *13*.
1277.27 *16*	1.64 *25*	1662.93	3/2$^+$,5/2$^+$	385.77	3/2$^+$				
1281.5 *2*	0.44 *13*	1281.82	3/2$^+$,5/2$^+$	0.0	1/2$^+$				
1288.86 *10*	5.4 *4*	1674.63	3/2$^+$,5/2$^+$	385.77	3/2$^+$	E2(+M1)	≥0.4	0.006 *3*	α(K)= 0.0046 *23*; α(L)= 0.0008 *4* Additional information 5. α(K)exp=0.0046 *24*.
[x]1382.9 *2*	0.82 *13*								
1584.49 *10*	2.1 *2*	2345.57	(3/2$^+$,5/2$^+$)	761.17	5/2$^+$	(M1)			α(K)exp=0.0055 *34*.
1647.14 *11*	2.6 *2*	1647.01	3/2$^+$,5/2$^+$	0.0	1/2$^+$				
1663.03 *21*	0.68 *11*	1662.93	3/2$^+$,5/2$^+$	0.0	1/2$^+$				
1674.62 *11*	3.3 *3*	1674.63	3/2$^+$,5/2$^+$	0.0	1/2$^+$				
[x]1727.05 *20*	0.54 *8*								
1854.04 *10*	6.8 *5*	1854.02	(1/2$^+$,3/2$^+$,5/2$^+$)	0.0	1/2$^+$				
[x]1975.75 *13*	1.34 *12*								
2043.77 *10*	1.86 *16*	2429.39	1/2,3/2,5/2$^{(+)}$	385.77	3/2$^+$				
[x]2112.73 *12*	1.21 *11*								
[x]2143.67 *17*	0.72 *9*								
2345.45 *10*	4.9 *4*	2345.57	(3/2$^+$,5/2$^+$)	0.0	1/2$^+$				
2429.02 *15*	0.52 *6*	2429.39	1/2,3/2,5/2$^{(+)}$	0.0	1/2$^+$				

[†] Deduced from α(K)exp measurements.
[‡] From α(K)exp, except as noted.
[#] For absolute intensity per 100 decays, multiply by ≈0.9.

$^{197}_{81}Tl_{116}$-4

^{197}Pb ε decay (8 min) 1979CoZI (continued)

$\gamma(^{197}Tl)$ (continued)

[@] 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.

$^{197}_{81}Tl_{116}$-5

^{197}Pb ε decay (8 min) 1979CoZI

Decay Scheme

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