^{100}Rh IT decay (4.6 min) 1980Ba59,1978Ki07,1982MaZP

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

Parent: ^{100}Rh: E=107.6 *2*; J^π=(5$^+$); $T_{1/2}$=4.6 min *2*; %IT decay≈98.3

^{100}Rh-%IT decay: %IT≈98.3 for the decay of ^{100}Rh isomer determined by 1980Ba59 from the decay rate of ^{100}Rh (4.6 min) and growth of 20.8 h ^{100}Rh. Other: 0.965 (deduced from Iγ(74.9γ) and Iγ(540γ) given by 1986Du04 and assuming total α=11 for 75γ).

1980Ba59: source was produced via ^{103}Rh(p,3np). Measured Eγ, Iγ, γ(t). Deduced levels, J, π, conversion coefficients, γ-ray multipolarities, isomer $T_{1/2}$.

1978Ki07: measured Eγ, Iγ, γ(t). Deduced levels, J, π, isomer $T_{1/2}$.

1982MaZP: ^{99}Ru(α,2np) and ^{100}Ru(α,3np). Measured Eγ, Iγ, γ(t). Deduced levels, conversion coefficients, γ-ray multipolarities, isomer $T_{1/2}$.

1998Hu13: ^{100}Ru(p,n) E=6-9 MeV. Measured isomer yield ratio.

Others: 1974Si18, 1984Ma30, 1986Du04.

$T_{1/2}$(isomer): 1974Si18, 1978Ki07, 1982MaZP.

Total decay energy deposit of 100 keV calculated by RADLIST code is in agreement with expected value of 106 keV.

^{100}Rh Levels

The level scheme presented here is as suggested by 1982MaZP.

The decay scheme does not seem well established in the absence of supporting coincidence data and ce data. The 32.6γ-74.9γ cascade seems to be correct based on intensity balance, thus defining the energy of the isomer at 107.6. Using α(th)=10.3 for 32.6γ (see ^{100}Pd ε decay) the intensity balance gives mult=M2 for 74.9γ as suggested by 1980Ba59. This gives J^π=4$^+$ for the isomer which is in conflict with the systematics of even-A Rh isotopes and the absence of transition to g.s. (J^π=1$^-$). Based on the observation of 42.1γ (also supported by the in-beam spectrum of 1984Ma30) 1982MaZP suggested that both the 74.9γ and 32.6γ are doublets, deexciting the known 74.9 level and the 107.6 isomer. This scheme is consistent with mult=E3 for a part of the 74.9γ and J^π=5$^+$ for the isomer, but remains to be confirmed through coincidence and conversion electron data.

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	1$^-$		
32.7 *2*	(2)$^-$		
74.9 *2*	(2)$^+$		
107.6 *2*	(5$^+$)	4.6 min *2*	%IT≈98.3 (1980Ba59); %ε+%β$^+$≈1.7 $T_{1/2}$: weighted average of 4.7 min *3* (1974Si18), 4.8 min *5* (1978Ki07), 4.5 min *3* (1982MaZP).

† From Eγ data.

‡ From the Adopted Levels.

γ(^{100}Rh)

Iγ normalization: I(γ+ce)(γs to g.s.)=100. The branching through this decay mode is 98.3%.

There are two main γ rays reported in the decay of this isomer: one at 32.6 and the other at 74.9. The third γ ray at 42.1 is reported by 1982MaZP and possibly by 1984Ma30 but 1978Ki07 report not observing such a transition. A 264.7 γ ray reported by 1974Si18 has not been seen in any later work (1978Ki07,1980Ba59,1986Du04), thus omitted here. Information concerning relative γ-ray intensities is only partially available. 1978Ki07, however, pointed out that the 32.6γ and 74.9γ have comparable γ-intensities. Coincidence data and ce data are not available to confirm the complete level scheme.

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$\gamma(^{100}Rh)$ (continued)

E_γ [†]	I_γ [‡@]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	δ [#]	α [&]	Comments
32.7[a] *2*	100[a]	32.7	$(2)^-$	0.0	1^-	M1+E2	0.15 *3*	10.1 *7*	α(K)=8.0 *3*; α(L)=1.8 *4*; α(M)=0.33 *7* α(N)=0.052 *11*; α(O)=0.00146 *4* I_γ: Iγ(32.7γ)/Iγ(74.9γ)=1.44 *52* (1978Ki07), 0.45 (1984Ma30).
32.7[a] *2*	0.022[a]	107.6	(5^+)	74.9	$(2)^+$	[M3]		5.76×10^3 *20*	α(K)=2.07×10^3 *5*; α(L)=2.96×10^3 *12*; α(M)=631 *25* α(N)=98 *4*; α(O)=2.03 *8*
42.1 *2*	11	74.9	$(2)^+$	32.7	$(2)^-$	[E1]		1.69 *4*	α(K)=1.46 *3*; α(L)=0.190 *4*; α(M)=0.0350 *7* α(N)=0.00555 *11*; α(O)=0.000207 *4* I_γ: using Iγ(42γ)/Iγ(75γ)=0.136 from the Adopted Gammas.
74.9[a] *2*	80[a]	74.9	$(2)^+$	0.0	1^-	E1		0.335 *6*	α(K)=0.291 *5*; α(L)=0.0355 *6*; α(M)=0.00654 *11* α(N)=0.001056 *17*; α(O)=4.46×10^{-5} *7*
74.9[a] *2*	20[a]	107.6	(5^+)	32.7	$(2)^-$	[E3]		51.6 *10*	α(K)=21.1 *4*; α(L)=24.8 *6*; α(M)=4.94 *11* α(N)=0.730 *16*; α(O)=0.00252 *5*

[†] From 1984Ma30 and 1982MaZP.
[‡] Arbitrarily assigned as 100 for 32.7γ and 74.9γ. The intensity division based on the suggested level scheme. Measured values are given under comments.
[#] From the Adopted Gammas.
[@] For absolute intensity per 100 decays, multiply by ≈0.0796.
[&] 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.
[a] Multiply placed with intensity suitably divided.

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Decay Scheme

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

@ Multiply placed: intensity suitably divided

%IT≈98.3