^{255}Rf α decay (1.68 s) 2006He27,2001He35

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 114, 1041 (2013)	1-Jan-2012

Parent: ^{255}Rf: E=0.0; J^{π}=(9/2$^-$); $T_{1/2}$=1.68 s *9*; Q(α)=9055 *4*; %α decay=42 *9*
^{255}Rf-$T_{1/2}$: From 2006He27. Other: 1.64 s *11* (2001He35).
^{255}Rf-Q(α): from 2012Wa38 Other: 9056 *4* (2011AuZZ).
^{255}Rf-Possible configuration=9/2[734] (2006He27).
^{255}Rf-%α decay: %SF=58 *9*, from Adopted Levels, Gammas; no evidence for ε decay (2001He35).
2006He27: ^{255}Rf isotope produced by the ^{207}Pb(^{50}Ti,2n) reaction at E=4.85 MeV/nucleon. Reaction products were separated from the primary beam by the SHIP velocity filter at GSI facility and implanted into a position-sensitive 16-strip PIPS detector. Measured Eγ, Iγ, $\gamma\gamma$, α-γ coin, ce, lifetimes with a 'clover' HPGe detector (composite of four Ge crystals).
All data are from 2006He27, unless otherwise stated.

^{251}No Levels

E(level)	J^{π}[†]	$T_{1/2}$	Comments
0.0[‡]	(7/2$^+$)	0.80 s *1*	%SF=0.0014 *+31−12* (2006He27) %SF is estimated by 2006He27 from detection of one fission event following α decay of ^{255}Rf. $T_{1/2}$: from 2006He27. Possible configuration=7/2[624] (2006He27).
60.3[‡] *3*	(9/2$^+$)		
203.6 *2*	(9/2$^-$)		Possible configuration=9/2[734] (2006He27).

[†] J^{π}'s and configurations assigned by 2006He27 are based on comparisons of decay pattern of ^{255}Rf with those of neighboring nuclides.
[‡] Band(A): 7/2[624] band.

α radiations

Eα[†‡]	E(level)	Iα[@]	HF	Comments
8575[#] *16*		1.0 *5*		Eα: statistical uncertainty=5 keV. Eα=8583 *10* in 2001He35. HF=80 is consistent with α transition to the 9/2$^-$ member of the 7/2[743] band in ^{251}No.
8646[#] *16*		1.5 *5*		Eα: statistical uncertainty=5 keV. This α group was not reported by 2001He35. HF=90 is consistent with α transition to the bandhead of the 7/2[743] band in ^{251}No.
8678[#] *17*		3 *1*		Eα: statistical uncertainty=8 keV. Eα=8670 *10*, 8684 in 2001He35. HF=56 (2006He27) is consistent with an α transition to the 11/2$^-$ member of 9/2[734] band, but the level energy difference of ≈38 keV between the 9/2 and 11/2 members is somewhat less than expected from systematics. 2006He27 suggest that the energy of this α group may be inflated by summing with conversion electrons resulting from the 11/2$^-$ to 9/2$^-$ γ transition in ^{251}No.
8906[#] *17*		2.5 *10*		Eα: statistical uncertainty=8 keV. Eα=8924 *15* in 2001He35. Possible transition to g.s. as in 2001He35, but 2006He27 question this assignment due to relatively low HF=1344 as compared to those for neighboring nuclides. 2006He27 suggest that this α group may be due to sum of 8716α and L and M conversion electrons.
8716 *16*	203.6	92 *5*	2.4	Eα: statistical uncertainty=4 keV. Eα=8722 *10* in 2001He35.

[†] Although several weak α groups have been reported in 2006He27 and in earlier studies (2001He35,1997He29), the fine structure of α particle decay of ^{255}Rf remains tentative for the following reasons: 1. α energies can populate levels from which the transitions are highly converted and the electron lines can sum up with the α lines; 2. some α-particles escape the stop detector. Their energy loss in the stop detector produces a tail of the α line towards lower energies 3. radiation damage of the detectors

Continued on next page (footnotes at end of table)

^{255}Rf α decay (1.68 s) 2006He27,2001He35 (continued)

α radiations (continued)

gives rise to statistical fluctuations in the α spectrum. See 2006He27 for greater details. Some weak α groups are individually discussed. Weak lines at 8692, 8773, 8797, 8831 and 8897 are all assigned by 2001He35 as sum lines (α+ce).

‡ Three types of uncertainties are combined in quadrature: statistical uncertainty of 4-8 keV; systematic uncertainty of 15 keV from calibration methods/standards; uncertainty of 3 keV due to reproducibility of an α peak energy.

Tentative α group (2006He27).

@ For absolute intensity per 100 decays, multiply by 0.42 *9*.

$\gamma(^{251}No)$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.†	α‡	Comments
60.3	$(9/2^+)$	(60.3)		0.0	$(7/2^+)$			
203.6	$(9/2^-)$	143.3 *2*	51 *6*	60.3	$(9/2^+)$	(E1)	0.0669	α(L)exp + α(M)exp<0.25 (2006He27) α(L)=0.0499 *8*; α(M)=0.01248 *18*; α(N+..)=0.00455 *7* α(N)=0.00348 *5*; α(O)=0.000905 *13*; α(P)=0.0001546 *23*; α(Q)=5.14×10^{-6} *8*
		203.6 *2*	49 *6*	0.0	$(7/2^+)$	E1	0.1143	α(K)exp<0.1 (2006He27); α(L)exp + α(M)exp<0.1 (2006He27) α(K)=0.0857 *13*; α(L)=0.0213 *3*; α(M)=0.00530 *8*; α(N+..)=0.00194 *3* α(N)=0.001482 *21*; α(O)=0.000388 *6*; α(P)=6.84×10^{-5} *10*; α(Q)=2.52×10^{-6} *4*

† From ce data (2006He27).

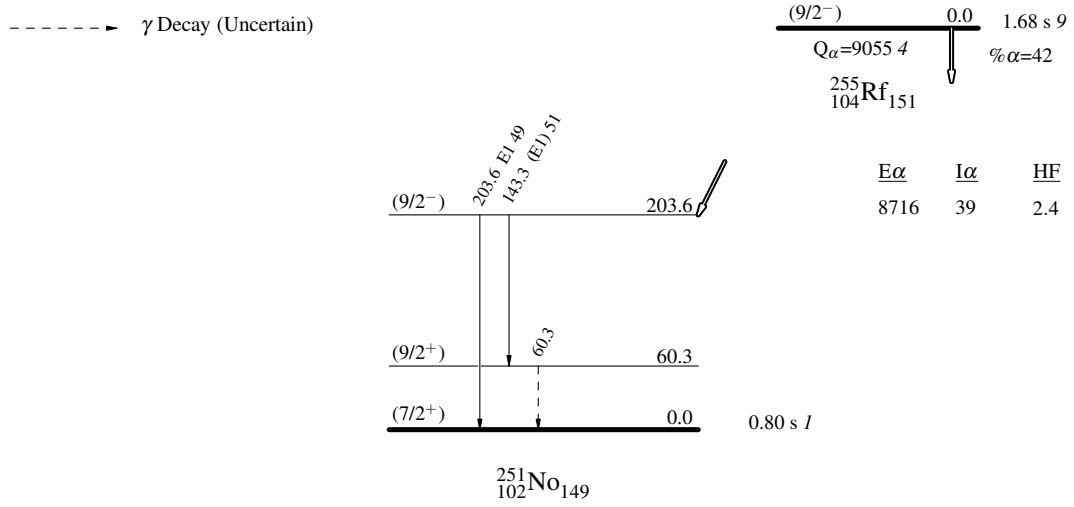
‡ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

x γ ray not placed in level scheme.

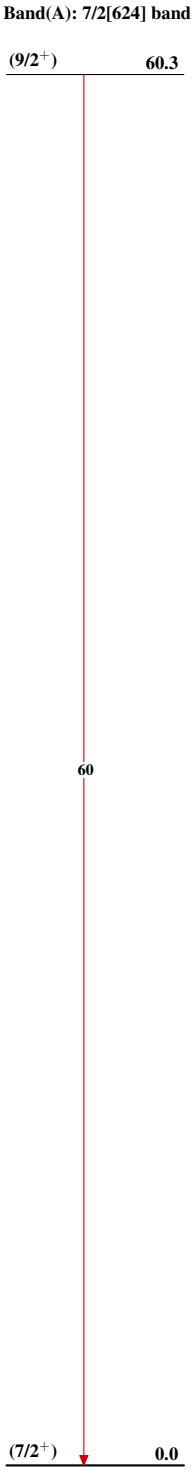
^{255}Rf α decay (1.68 s) 2006He27,2001He35

Decay Scheme

Intensities: % photon branching from each level



^{255}Rf α decay (1.68 s) 2006He27,2001He35



$^{251}_{102}No_{149}$