^{35}Al β^- decay (38.1 ms) 2005Ti11,2001Nu01

Parent: ^{35}Al: E=0; J^π=(5/2)$^+$; $T_{1/2}$=38.1 ms *4*; Q(β^-)=14170 *40*; %β^- decay=100.0

^{35}Al-J^π,$T_{1/2}$: From the Adopted Levels of ^{35}Al.

^{35}Al-Q(β^-): From 2021Wa16.

2005Ti11,2006AnZW: A ^{35}Al secondary beam at ≈2 pps was produced via the fragmentation of a 78-MeV/nucleon ^{36}S primary beam and selected by the LISE3 spectrometer at GANIL. A total of 3.46×10^5 ^{35}Al ions were continuously implanted into an NE102A plastic scintillator also for detecting β. The implantation detector was sandwiched between two silicon detectors for monitoring beam and for veto, respectively. Neutrons were detected using the TONNERRE array consisting of 19 plastic scintillator modules. γ rays were detected using two EXOGAM clover modules and a LEPS detector. Measured Eγ, Iγ, E_n, I_n, $\beta\gamma$-coin, βn-coin, and βnγ-coin. Deduced the decay scheme consisting of ^{35}Si and ^{34}Si levels, ^{35}Al $T_{1/2}$, decay branching ratios, log *ft*, B(GT), and β-delayed neutron emission probability. Comparisons with shell-model calculations.

2001Nu01,2002Nu02: Exp 1: A ^{35}Al secondary beam at 8 pps was produced via the fragmentation of a UC target with 1.4 GeV protons at ISOLDE, CERN with subsequent surface-ionization and mass separation. ^{35}Al ions were collected onto a moving tape. β particles were detected using a thin cylindrical plastic scintillator, γ rays were detected using two Ge detectors, and neutrons were detected using eight low-threshold plastic scintillators. Measured Eγ, Iγ, E_n, I_n, $\beta\gamma$-coin, $\gamma\gamma$-coin, βn-coin. Deduced the decay scheme consisting of ^{35}Si and ^{34}Si levels, ^{35}Al $T_{1/2}$, decay branching ratios, log *ft*, and β-delayed neutron emission probability. Comparisons with shell-model calculations. Exp 2: A lifetime measurement for the 974-keV level in ^{35}Si used a thin plastic scintillator for detecting β and a BaF_2 detector for detecting γ.

Other experimental studies on ^{35}Al $T_{1/2}$ and β-delayed neutron emission probability: 2017Ha23, 1999YoZW, 1995ReZZ/2008ReZZ, 1989MuZU, 1989Le16, 1988MuZY, 1988Mu08, 1988DuZT, 1988BaYZ, 1987DuZU, 1987BaZI.

Theoretical studies involving ^{35}Al decay: 2018Yo06, 2013Li39.

^{35}Si Levels

E(n) under comments are deduced from $E(n)_{c.m.}$=E(level)(^{35}Si)−S(n)(^{35}Si)-E(level)(^{34}Si), with E(level)(^{35}Si) reported in 2005Ti11 based on the neutron time-of-flight spectrum. 2005Ti11 used E(level)(^{34}Si)=3326 for E(n1). 2005Ti11 used S(n)(^{35}Si)=2474 *43*, consistent with S(n)(^{35}Si)=2470 *40* from 2021Wa16.

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0	(7/2)$^-$		
909.95 *23*	(3/2)$^-$	55 ps *14*	
973.88 *18*	(3/2$^+$)	5.9 ns *6*	$T_{1/2}$: lifetime=8.5 ns *9* from $\beta\gamma$(t) in 2001Nu01, also adopted in the Adopted Levels.
2168.16 *36*	(5/2$^+$)		
3140	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=666.
3450	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=976.
3770	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=1296.
5190	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=2716.
5760	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=3286.
6330	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n0)_{c.m.}$=3856; $E(n1)_{c.m.}$=530.
7360	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n1)_{c.m.}$=1560.
7690	(3/2$^+$,5/2$^+$,7/2$^+$)		Deduced $E(n1)_{c.m.}$=1890.

† From a least-squares fit to γ-ray energies for levels connected with γ transitions. For unbound levels, from 2005Ti11 based on the neutron time-of-flight spectrum.

‡ From the Adopted Levels of ^{35}Si.

^{35}Al β^- decay (38.1 ms) 2005Ti11,2001Nu01 (continued)

β^- radiations

E(decay)	E(level)	Iβ^- †#	Log *ft*‡	Comments
(6.48×10^3 *4*)	7690	2.7 *2*	4.5	
(6.81×10^3 *4*)	7360	2.6 *2*	4.6	
(7.84×10^3 *4*)	6330	6.8 *3*	4.5	
(8.41×10^3 *4*)	5760	4.5 *2*	4.8	
(8.98×10^3 *4*)	5190	8.9 *3*	4.6	
(1.040×10^4 *4*)	3770	3.2 *2*	5.4	
(1.072×10^4 *4*)	3450	6.0 *3*	5.2	
(1.103×10^4 *4*)	3140	3.3 *2*	5.5	
(1.200×10^4 *4*)	2168.16	9.5	5.2	Iβ^-: 9.2 *19* from 2001Nu01; 6.7 *9* from 2005Ti11 with only one branch 2168γ observed.
(1.320×10^4 *4*)	973.88	52	4.7	Iβ^-: 48 *9* from 2001Nu01; 50 *3* from 2005Ti11.
(1.326×10^4 *4*)	909.95			Iβ^-: <0.9 from 2001Nu01 without considering the conversion electron of the 974−>910 transition. The net feeding is deduced to be −1.9 *9* from the γ+ce intensity balance.
(1.417×10^4 *4*)	0	3.0 *10*	6.1 *2*	Iβ^-: 2001Nu01 stated that the β branch to the ^{35}Si ground state was evaluated by comparing the total γ intensity due to the deexcitation of excited states of ^{35}Si with the decay of ^{35}Si activity and assuming no direct ^{35}Si production.

† For bound excited states, Iβ^- is from the γ+ce intensity balance at each state. Quoted Iβ^- values without uncertainties are considered upper limits due to the incomplete decay scheme, and the associated log *ft* values are considered lower limits. For unbound excited states, Iβ^- is from the absolute Iβ^- in 2005Ti11 based on neutron intensities.
‡ For unbound levels, 2005Ti11 did not report uncertainties for neutron energies or level energies. The evaluators estimate the uncertainties of log *ft* are <0.1, assuming a 200-keV uncertainty in level energies.
# Absolute intensity per 100 decays.

γ(^{35}Si)

Iγ normalization: 0.47 *4* from Σ%I(γ+ce to g.s.)=60 *4*, deduced from 100−%β^-n-%Iβ^-(g.s.), where %β^-n=37 *4* from the Adopted Levels of ^{35}Al and %Iβ^-(g.s.)=3.0 *10* from 2001Nu01. The deduced normalization factor should be considered an upper limit due to potential missing γ transitions from unobserved levels in the gap to the ground state. Other: 0.45 from 2001Nu01, based on %β^-n=41 *13*.

E_γ †	I_γ †‡	E_i(level)	J^π_i	E_f	J^π_f	Mult.	α #	Comments
64.1 *3*	100	973.88	(3/2$^+$)	909.95	(3/2)$^-$	[E1]	0.0368 *8*	%Iγ=47
910.11 *30*	99.7 *19*	909.95	(3/2)$^-$	0	(7/2)$^-$	[E2]	4.13×10^{-5} *6*	%Iγ=47
973.78 *20*	11.8 *24*	973.88	(3/2$^+$)	0	(7/2)$^-$	[M2]	5.05×10^{-5} *7*	%Iγ=5.6
^{x}1130.4 *4*	3.2 *9*							%Iγ=1.5
1194.2 *4*	5.3 *12*	2168.16	(5/2$^+$)	973.88	(3/2$^+$)			%Iγ=2.5
2168.2 *6*	15 *3*	2168.16	(5/2$^+$)	0	(7/2)$^-$			%Iγ=7.1
^{x}5629 *3*	2.4 *12*							%Iγ=1.1

† From 2001Nu01.
‡ For absolute intensity per 100 decays, multiply by 0.47.
# Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with “Frozen Orbitals” approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
^{x} γ ray not placed in level scheme.

^{35}Al β^- decay (38.1 ms) 2005Ti11,2001Nu01