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

Parent: ^{35}Al: E=0; J$^\pi$=(5/2)$^+$; T$_{1/2}$=38.1 ms *4*; Q(β^-)=14170 *40*; %β^- decay=100.0
^{35}Al-J$^\pi$,T$_{1/2}$: From 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) 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. E(level)(^{34}Si)=3326 in 2005Ti11. S(n)(^{35}Si)=2474 *43* in 2005Ti11, comparable to 2470 *40* from 2021Wa16.

E(level)†	J$^\pi$‡	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 the β-γ time-difference spectrum in 2001Nu01.
2168.2 *4*	5/2$^+$		
3140			E(n0)$_{c.m.}$=666.
3450			E(n0)$_{c.m.}$=976.
3770			E(n0)$_{c.m.}$=1296.
5190			E(n0)$_{c.m.}$=2716.
5760			E(n0)$_{c.m.}$=3286.
6330			E(n0)$_{c.m.}$=3856; E(n1)$_{c.m.}$=530.
7360			E(n1)$_{c.m.}$=1560.
7690			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.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Log *ft*
(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

Continued on next page (footnotes at end of table)

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

β^- radiations (continued)

E(decay)	E(level)	Iβ^{-} †‡	Log *ft*	Comments
(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*)	2168.2	9.2 *19*	5.2 *1*	Iβ^-: From 2001Nu01. Other: 6.7 *9* from 2005Ti11 with only one branch 2168γ observed.
(1.320×10^4 *4*)	973.88	50 *3*	4.69 *4*	Iβ^-: weighted average of 48 *9* (2001Nu01) and 50 *3* (2005Ti11).
(1.326×10^4 *4*)	909.95	<0.9	>6.4	
(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 levels, from the absolute Iβ^- in 2001Nu01 based on γ-ray intensities, unless otherwise noted. For unbound levels, from the absolute Iβ^- in 2005Ti11 based on neutron intensities.
‡ Absolute intensity per 100 decays.

γ(^{35}Si)

Iγ normalization: From 2001Nu01.

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=45 B(E1)(W.u.)=3.52×10^{-4} *+43−34*
910.11 *30*	99.7 *19*	909.95	(3/2)$^-$	0	(7/2)$^-$			%Iγ=45
973.78 *20*	11.8 *24*	973.88	(3/2$^+$)	0	(7/2)$^-$	[M2]	5.05×10^{-5} *7*	%Iγ=5.3 B(M2)(W.u.)=0.057 *+13−12*
^{x}1130.4 *4*	3.2 *9*							%Iγ=1.4
1194.2 *4*	5.3 *12*	2168.2	5/2$^+$	973.88	(3/2$^+$)			%Iγ=2.4
2168.2 *6*	15 *3*	2168.2	5/2$^+$	0	(7/2)$^-$			%Iγ=6.8
^{x}5629 *3*	2.4 *12*							%Iγ=1.1

† From 2001Nu01.
‡ For absolute intensity per 100 decays, multiply by 0.45.
# 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

Decay Scheme

Intensities: Relative I_γ