^{38}Al β^- decay 2015St14

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 152, 1 (2018)	30-Sep-2017

Parent: ^{38}Al: E=0; $J^\pi=(0^-)$; $T_{1/2}$=9.0 ms *7*; Q(β^-)=20.38×10^3 *39*; %β^- decay=?

Parent: ^{38}Al: E=0+x; $J^\pi=(5^-)$; $T_{1/2}$=9.0 ms *7*; Q(β^-)=20.38×10^3 *39*; %β^- decay=?

^{38}Al(0+x)-E,J^π: Shell-model calculations predicts a 0^- ground state and a low-lying 5^- first excited state (2015St14). The authors argue that the proposed 3703-keV level in ^{38}Si could be strongly populated by the decay of isomer while the observed 3656-keV transition could be from the decay of ground state. Parentheses around J^π were added by the evaluator.

^{38}Al(0+x)-$T_{1/2}$: From β-delayed 418γ(t), 1074γ(t), 1159γ(t) and 1470γ(t) (2015St14). These γ-ray transitions could be from β-decay of ^{38}Al (0^-) ground state or (5^-) isomer or both and thus the evaluator has assigned the measured value of $T_{1/2}$ to both states; same values in Adopted Levels of ^{38}Al.

^{38}Al(0+x)-Q(β^-): From 2017Wa10.

2015St14: ^{38}Al ions were produced by fragmentation of a 345 MeV/nucleon ^{48}Ca beam from the RIBF facility at RIKEN on a 15 mm beryllium target. Fragments were separated and identified using the BigRIPS spectrometer and the zero-degree spectrometer (ZDS), with energy loss measured by a multi-sampling ionization chamber (MUSIC) and positions by PPACs. The selected ions were implanted into the CAITEN detector (Cylindrical Active Implantation Target for Exotic Nuclei), consisting of a segmented movable hollow-cylindrical-shape plastic scintillator and a stationary ring of 24 position-sensitive photomultiplier tubes (PSPMTs). γ rays were detected by three HPGe detectors. Measured Eγ, Iγ, implantation-decay-correlation, $\beta\gamma$-coin, $\gamma\gamma$-coin, $\beta\gamma$(t). Deduced levels, J, π, half-life. Comparison with shell-model (SDPF-μ) calculations.

The decay scheme given here is incomplete since the β-delayed neutron decay branches were not measured.

^{38}Si Levels

E(level)†	J^π‡	Comments
0	0^+	
1074 *2*	2^+	J^π: from Adopted Levels based on Coulomb excitation from 0^+; (2^+) from from shell-model predictions (2015St14).
2233 *3*	(4^+)	
3285 *3*	(3)	
3656?	(1^-)	E(level): possibly populated by the β-decay of ground state (2015St14).
3703 *3*	(4^+)	E(level): strongly populated by the β-decay of (5^-) isomer based on shell-model calculations (2015St14).

† From Eγ.

‡ From shell-model predictions (2015St14), unless otherwise noted; same values in Adopted Levels.

γ(^{38}Si)

Eγ	Iγ	E$_i$(level)	J_i^π	E$_f$	J_f^π
418 *2*	32 *5*	3703	(4^+)	3285	(3)
1074 *2*	100 *12*	1074	2^+	0	0^+
1159 *2*	59 *7*	2233	(4^+)	1074	2^+
1470 *2*	42 *5*	3703	(4^+)	2233	(4^+)
2211 *2*	20 *5*	3285	(3)	1074	2^+
3656†	16 *6*	3656?	(1^-)	0	0^+

† Placement of transition in the level scheme is uncertain.

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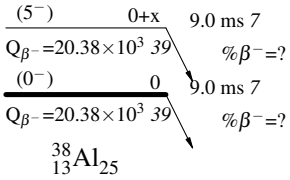
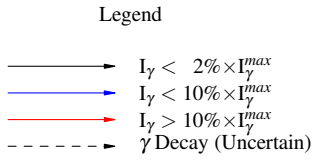
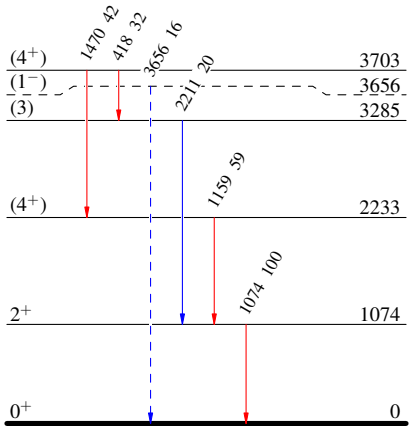
Decay Scheme

Intensities: Relative I_γ







$^{38}_{14}Si_{24}$