^{193}Rn α decay (1.15 ms) 2006An36

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	31-Aug-2021

Parent: ^{193}Rn: E=0; $T_{1/2}$=1.15 ms *27*; Q(α)=8040 *12*; %α decay≈100.0

^{193}Rn-E,$T_{1/2}$: From ^{193}Rn Adopted Levels in the ENSDF database (March 2017 update). No new references after this update.

^{193}Rn-Q(α): From 2021Wa16.

^{193}Rn-%α decay: %α≈100 for ^{193}Rn decay (2006An36).

2006An36: ^{193}Rn produced and identified in ^{144}Sm(^{52}Cr,3n) reaction at E=252 MeV; $^{144}SmF_3$ rotating target onto a carbon backing. UNILAC heavy-ion facility at GSI, with SHIP velocity filter for separating evaporation residues.

Several different types of detectors were used by 2006An36. The decays of the evaporation residues were measured by implanting residues in a thick 16-strip position-sensitive silicon detector (PSSD) with a typical FWHM ≈ 20 keV for α particles in 6-8 MeV range. An array of six silicon detectors of similar shape (BOX detectors), mounted upstream of PSSD detector, was used to measure the energies of α, β and conversion electrons. Three thin time-of-flight detectors in front of the PSSD and BOX detectors permitted identification of reaction products from the scattered beam particles; and distinction between the decay events and implantation events through anti-coincidence technique. An additional thick Si detector was installed as a veto detector behind the PSSD detector in an anti-coincidence mode. This allowed distinction between the decays and the punch-through events (from high-energy protons and α particles produced in the reactions on the carbon backing). For γ rays, a four-fold segmented 'Clover' Ge detector was used behind the PSSD detectors for prompt and delayed γ(residues) coin and/or $\alpha\gamma$ coin measurements. Measured α, γ, $\alpha\gamma$ coin, α(residues) coin, γ(residues) coin.

^{189}Po Levels

E(level)	J^π †	$T_{1/2}$ †	Comments
0	$(5/2^-)$	3.5 ms *5*	
194	$(3/2^-,5/2^-,7/2^-)$		J^π: (M1) γ to the $(5/2^-)$. The α hindrance factor of 1.9 suggests favored α decay, and similar J^π values for this level and the ^{193}Rn g.s. parent.

† From the Adopted Levels.

α radiations

Eα	E(level)	Iα #	HF †‡	Comments
7685 *15*	194	74 *20*	≈1.6	HF: 1 (2006An36).
7875 *20*	0	26 *12*	≈17	HF: ≈11 (2006An36).

† Deduced by evaluators using $r_0(^{189}Po)$=1.5875 *130*, from unweighted average of $r_0(^{190}Po)$=1.590 *11* and $r_0(^{192}Po)$=1.585 *15* taken from 2020Si16 evaluation.

‡ The nuclear radius parameter $r_0(^{189}Po)$=1.588 *13* as specified by the user.

For absolute intensity per 100 decays, multiply by ≈1.0.

$\gamma(^{189}Po)$

Eγ	Iγ †	E$_i$(level)	J_i^π	E$_f$	J_f^π	Mult.	α ‡	I$_{(\gamma+ce)}$ †	Comments
194	28 *8*	194	$(3/2^-,5/2^-,7/2^-)$	0	$(5/2^-)$	(M1)	1.69	74 *20*	α(K)=1.38; α(L)=0.24; α(M)=0.057; α(N)=0.0147; α(O)=0.00308; α(P)=0.000398 α: Theoretical conversion coefficient from BrIcc code. I$_{(\gamma+ce)}$: from Iα=74 *20* per 100 α decays. I$_\gamma$: from I(γ+ce) and α.

Continued on next page (footnotes at end of table)

^{193}Rn α decay (1.15 ms) 2006An36 (continued)

$\gamma(^{189}Po)$ (continued)

E_γ	E_i(level)	Comments
		Mult.: from α(K)exp≈2 (from ce data,2006An36).

† For absolute intensity per 100 decays, multiply by ≈1.0.

‡ 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.

^{193}Rn α decay (1.15 ms) 2006An36

Decay Scheme

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