^{256}Md α decay 2000Ah02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	A. M. Mattera, S. Zhu, A. B. Hayes, E. A. Mccutchan	NDS 172, 543 (2021)	1-Jan-2021

Parent: ^{256}Md: E=0.0; J^{π}=(1$^-$); $T_{1/2}$=77.5 min *16*; Q(α)=7737 *SY*; %α decay=9.5 *5*

^{256}Md-$T_{1/2}$: weighted average of 78.1 min *18* (1993Mo18), 77 min *5* (1971Ho16), and 75 min *4* (1970Fi12).

^{256}Md-%α decay: weighted average of 8.5% *8* (1970Fi12), 9.9% *5* (1971Ho16) and 11% *3* (1993Mo18).

^{256}Md-Q: From 2017Wa10. Deduced Q(α)=7798 *8* assuming the 7676-keV α decays to the ^{252}Es g.s.

2000Ah02: ^{256}Md was produced in reactions of ^{253}Es(α,2n) at the Argonne 152-cm cyclotron, and was removed from the target by a helium jet system and chemically isolated. α, γ and α-γ were measured with Si and Ge(Li) detectors. Five α decays were observed and their energies were measured with samples covering small solid angle to the Si detector for minimizing α-electron summing, and with calibration standards from 1991Ry01. Total 4 γ rays with Eγ=99.4 keV, 122.8 keV, 378.5 keV and 408.5 keV were observed in coincidence with the 7206-keV α. One γ ray with Eγ=445 keV *1* was in coincidence with the 7142-keV α. These γ rays were not placed in the level scheme of ^{252}Es because of the complexity of levels in an odd-odd nucleus.

Other: 2019Ah04, 1993Mo18, 1971Ho16, 1970Ri12.

The 5 α branches are adopted from 2000Ah02 based on the following considerations. The peak shape of high energy and weak α rays in the spectrum is clearly visible. No peaks with intensity larger than 1% are visible. In 1993Mo18, the determination of the high energy α rays was not a unique solution because of poor detector resolution and conversion-electron summing incurred by the large detector solid angle (≈30% of 4π). In 1971Ho16, the peaks in the region beyond 7.3 MeV are statistically less certain. In 1970Fi12, the statistics in the high energy region are also poor to make a definite assignment of every peak.

^{252}Es Levels

E(level)[†]	J^{π}[‡]	Comments
0.0	(5$^-$)	
35 *11*		
436 *9*		
476 *8*	(1$^-$)	J^{π}: Favored α from ^{256}Md g.s, which was suggested to be J=1$^-$, K=0 with configuration $\pi 7/2^-[514]\otimes\nu 7/2^+[613]$ (1993Mo18).
542 *9*		

[†] Calculated from Eα's by assuming that the 7676-keV α feeds the ^{252}Es g.s based on the fact that it is not in coincidence with any of the observed γ rays and having the highest energy of all of the observed α transitions.

[‡] From the Adopted Levels. Support derived from this dataset is given in the comments.

α radiations

Eα[†]	E(level)	Iα[†#]	HF[‡]	Comments
7142 *5*	542	22 *1*	4.1 *4*	
7207 *2*	476	71 *2*	2.33 *16*	Eα: From 2019Ah04.
7247 *5*	436	2.5 *5*	96 *21*	
7642 *8*	35	2.1 *5*	3.8×10^3 *10*	
7676 *8*	0.0	2.5 *5*	4.31×10^3 *91*	

[†] From 2000Ah02 unless otherwise noted. Other measurements: 1993Mo18, 1971Ho16 and 1970Fi12. 1993Mo18 with Eα calibration standards of 1973Ry07: 7155 *5* (21% *2*); 7221 *3* (47% *3*); 7455 *6* (4.5% *5*); 7532 *10* (2.5% *5*); 7611 *10* (1.5% *5*); 7678 *6* (4.0% *4*); 7773 *16* (0.5% *3*), and an unresolved group of α between 7221 and 7455 (19% *2*). 1971Ho16 with Eα(^{253}Es)=6.640 MeV and Eα(^{256}Fm)=6.925 MeV as calibration energies: 7.160 MeV *15* (16% *2*); 7.23 MeV *1* (63% *4*); 7.33 MeV *3* (4% *1*); 7.46 MeV *3* (5% *1*); 7.49 MeV *2* (6% *1*); 7.67 MeV *3* (2% *1*) and 7.72 MeV *2* (4% *1*). 1970Fi12 with Eα(^{253}Es)=6.632 MeV and Eα(^{256}Fm)=6.911 MeV as calibration energies: 7.136 MeV *5* (21% 3); 7.202 MeV *5* (69% *5*); 7.44 MeV *1* (≈2%); 7.58 MeV *1* (≈2%); 7.64 MeV *1* (≈4%) and 7.67 MeV *1* (≈2%).

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^{256}Md α decay 2000Ah02 (continued)

α radiations (continued)

‡ $r_0(^{252}Es)$=1.488 *7*, unweighted average of $r_0(^{250}Cf)$=1.4887 *8*, $r_0(^{252}Cf)$=1.499 *4* and $r_0(^{252}Fm)$=1.4762 *19*.
# For absolute intensity per 100 decays, multiply by 0.095 *5*.

$\gamma(^{252}Es)$

Es K x-rays measured by 2000Ah02: Kα_1 = 118.0 keV, Kα_2 = 112.5 keV, Kβ_1' = 132.5 keV, Kβ_2' = 137.0 keV.

E_γ †	E_i(level)
x99.4	
x122.8	
x378.5	
x408.5	
x445 *1*	

† Assigned to ^{252}Es based on them in coincidence with 7207α, except 445γ which is in coincidence with 7142α (2000Ah02).
x γ ray not placed in level scheme.