## $^{237}$Cf $\alpha$ decay (0.8 s)　　**2010Kh06**

### History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | B. Singh, J. K. Tuli, E. Browne | NDS 170, 499 (2020) | 8-Oct-2020 |

Parent: $^{237}$Cf: E=0; $T_{1/2}$=0.8 s $2$; Q($\alpha$)=8220 $50$; %$\alpha$ decay=70 $10$

$^{237}$Cf-$J^{\pi}$: 5/2$^+$ suggested from systematic trend (2017Au03), but if $J^{\pi}$=3/2$^+$ for the g.s. of $^{233}$Cm as suggested from systematic trend (2017Au03), then 3/2$^+$ is also likely from g.s. to g.s. $\alpha$ hindrance factor of 0.72 $24$, deduced by the evaluators based on $r_0$=1.510 $5$.

$^{237}$Cf-$T_{1/2}$: Measured by 2010Kh06, weighted average of 0.6 s $3$ and 0.9 s $3$ from Evaporation residues (ER)-SF and ER-$\alpha$ correlated events, respectively. Other: 2.4 s $+8-4$ and 1.9 s $3$ from 1995La09.

$^{237}$Cf-Q($\alpha$): From 2017Wa10.

$^{237}$Cf-%$\alpha$ decay: %$\alpha$=70 $10$, %SF=30 $10$ (2010Kh06) for the decay of $^{237}$Cf.

2010Kh06: $^{237}$Cf activity produced in reactions $^{204}$Pb($^{36}$S,3n), E=163.6, 170.0, 172.6, 173.0 and 174.3 MeV. $^{36}$S beam produced from the high charge state injector with ECR-ion source of the UNILAC accelerator at GSI, beam intensity up to 950 pnA. Target of chemical compound PbS with isotopic enrichment of >99% were used. Evaporation residues (ER) separated from the primary beam and target-like ions by the velocity filter SHIP and ERs detected by a position-sensitive 16 strip Si detector (stop detector). A Ge clover detector behind the Si detector for detecting x rays and/or $\gamma$-rays. Measured $T_{1/2}$ and decay modes. Decay of $^{237}$Cf is followed through $\alpha$-decay chain: $^{237}$Cf $\rightarrow$ $^{233}$Cm $\rightarrow$ $^{229}$Pu $\rightarrow$ $^{225}$U $\rightarrow$ $^{221}$Th $\rightarrow$ $^{217}$Ra $\rightarrow$ $^{213}$Rn $\rightarrow$ $^{209}$Po. Since $^{233}$Cm and $^{229}$Pu decay by $\varepsilon$ mode as well, there is a parallel $\alpha$-decay chain through these modes: $^{233}$Am $\rightarrow$ $^{229}$Np $\rightarrow$ $^{225}$Pa $\rightarrow$ $^{221}$Ac $\rightarrow$ $^{217}$Fr $\rightarrow$ $^{213}$At $\rightarrow$ $^{209}$Bi.

### $^{233}$Cm Levels

| E(level) | $T_{1/2}$ | Comments |
|---|---|---|
| 0 | 23 s $+13-6$ | %$\alpha$=20 $10$ (2010Kh06); %$\varepsilon$+%$\beta^+$=80 $10$ (2010Kh06)<br>$J^{\pi}$: $J^{\pi}$ values of the ground states of $^{237}$Cf and $^{233}$Cm are expected to be the same from $\alpha$ hindrance factor of $\approx$1. From systematics trend, 2017Au03 suggested 3/2$^+$ for g.s. of $^{233}$Cm.<br>$T_{1/2}$: from Adopted Levels, measured by 2010Kh06. |

### $\alpha$ radiations

| E$\alpha$ | E(level) | HF[†] | Comments |
|---|---|---|---|
| 8081 $20$ | 0 | 0.72 $24$ | E$\alpha$: from 2010Kh06.<br>HF: deduced by evaluators using $r_0$=1.510 $5$ from systematic trend of $r_0$ for Cf to Cm $\alpha$ decays in Fig. 6 of 2020Si16.<br>2010Kh06 give $\alpha$-hindrance factor of $\approx$1, with no details provided about the method. |

[†] $r_0$=1.510 $5$, estimated from extrapolation of $r_0$ plot for Cf to Cm decays in Fig. 6 of 2020Si16.