

Adopted Levels:tentative

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 166, 1 (2020)	20-Apr-2020

S(p)=-760 50; Q(α)=8090 50 [2017Wa10](#)

[2014Zh03](#): ^{205}Ac produced and identified in $^{169}\text{Tm}(^{40}\text{Ca},4n)$ reaction, $E(^{40}\text{Ca})=196$ MeV at HIRFL, Lanzhou. The target was $400\text{ }\mu\text{g}/\text{cm}^2$ thick and covered with a thin $10\text{ }\mu\text{g}/\text{cm}^2$ carbon layer. Evaporation residues were separated in flight using the gas-filled recoil separator SHANS and implanted into a position sensitive silicon detector ($150\times 50\text{ mm}^2$ with 48 vertical strips, 3 mm width, FWHM=70 keV for $E\alpha=6\text{--}7$ MeV). Eight non-position sensitive Si detectors ($50\times 50\text{ mm}^2$) were located perpendicular to the face of the implantation detector to detect escape $E\alpha$'s. The nuclei of interest were identified by energy, time, and position correlations of implanted evaporation residues and their subsequent α decays with the observation of $\alpha_1\text{--}\alpha_2\text{--}\alpha_3$ correlated events. Calibration of the Si detectors was completed using internal decays of ^{200}Po (5863 keV 2), ^{201}At (6344 keV 2), ^{204}Rn (6418.9 keV 25), ^{206}Fr (6790 keV 4), ^{205}Fr (6915 keV 4), and ^{204}Fr (7031 keV 5).

 ^{205}Ac Levels

E(level)	J^π	$T_{1/2}$	Comments
0.0	(9/2 ⁻)	20 ms +97-9	<p>$\% \alpha \approx 100$ $\% \alpha$: Only α decay mode was observed. J^π: Assuming favored α decay to the ^{201}Fr g.s. ($J^\pi=9/2^-$) and systematics of single-particle proton structures above $Z=82$. The assignment is tentative. $T_{1/2}$: From $7935\alpha(t)$ in 2014Zh03. configuration: $\pi(h_{9/2}^{+1})$ and spherical shape. The assignment is tentative. Only one correlated decay-chain event was observed with $E\alpha(1)=7935\text{ }30$ keV, $\Delta t(1)=29.1$ ms; $E\alpha(2)=7406$ keV, $\Delta t(2)=85$ ms and $E\alpha(3)=6997$ keV, $\Delta t(3)=2.08$ s. Definite assignment is ambiguous, since: $E\alpha(2)$ is consistent with $E\alpha$'s of both, the ^{201}Fr g.s. ($J^\pi=9/2^-$) [$E\alpha=7369$ keV 3 (2005Uu02,2007Ko06)] and the ^{201m}Fr isomer ($J^\pi=1/2^+$) [$E\alpha=7454$ keV 8 (2005Uu02,2007Ko06)], but $\Delta t(2)$ is consistent only with $T_{1/2}$ for the ^{201}Fr g.s. ($J^\pi=9/2^-$) [$T_{1/2}=62$ ms 5 (2007Ko06)] (^{201m}Fr isomer ($J^\pi=1/2^+$) [$T_{1/2}=19$ ms +19-6 (2007Ko06)]); $E\alpha(3)$ is only consistent with $E\alpha$ of ^{197}At g.s. ($J^\pi=9/2^-$) [$E\alpha=6959$ keV 6 (2005Uu02)] (^{197m}At isomer ($J^\pi=1/2^+$) [$E\alpha=6706$ keV 6 (2005Uu02)]), but $\Delta t(3)$ is close to $T_{1/2}$ of the ^{197m}At isomer ($J^\pi=1/2^+$) [$T_{1/2}=1.1$ s +11-4 (2005Uu02)] (^{197}At g.s. ($J^\pi=9/2^-$) [$T_{1/2}=340$ ms 20 (2005Uu02)]).</p> <p>Measured cross section ≈ 70 pb at $E(^{40}\text{Ca})=196$ MeV), assuming 14% efficiency of the SHANS separator.</p>