$^{141}_{58}\mathrm{Ce}_{83}$

1 Decay Scheme

Ce-141 decays by beta minus emission. The main beta transition (70%) leads to the 145 keV level of Pr-141, the weaker beta transition (30%) feeds directly the ground state of Pr-141.
Le cérium 141 se désintègre par émission bêta principalement (70 %) vers le niveau excité de 145 keV du praséodyme 141 et pour 30 % vers le niveau fondamental.

2 Nuclear Data

$T_{1/2}(^{141}\mathrm{Ce}\ )$: 32,503 (11) d
$Q^{-}(^{141}\mathrm{Ce}\ )$: 580,4 (11) keV

2.1 β^- Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta^-_{0,1}$	435,0 (11)	69,97 (44)	1st forbidden	6,97
$\beta^-_{0,0}$	580,4 (11)	30,03 (44)	1st forbidden	7,76

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ × 100	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Pr)	145,4433 (14)	69,97 (44)	M1+0,46%E2	0,383 (6)	0,0529 (8)	0,01116 (16)	0,449 (7)

3 Atomic Data

3.1 Pr

ω_K : 0,914 (4)
$\bar{\omega}_L$: 0,132 (5)
n_{KL} : 0,871 (4)

3.1.1 X Radiations

		Energy keV		Relative probability
X_K				
	$K\alpha_2$	35,5506		54,76
	$K\alpha_1$	36,0267		100
	$K\beta_3$	40,6533	}	
	$K\beta_1$	40,7487	}	
	$K\beta_5''$	41,05	}	30,42
	$K\beta_2$	41,774	}	
	$K\beta_4$	41,877	}	7,79
	$KO_{2,3}$	41,968	}	
X_L				
	$L\ell$	4,458		
	$L\alpha$	5,0129 – 5,0343		
	$L\eta$	4,9337		
	$L\beta$	5,4887 – 5,9032		
	$L\gamma$	6,1375 – 6,617		

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	28,162 – 29,890	100
KLX	33,576 – 36,004	49,4
KXY	38,97 – 41,95	6,1
Auger L	2,94 – 6,79	

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e_{AL}	(Pr)	2,94 - 6,79	16,15 (11)
e_{AK}	(Pr)		1,59 (8)
	KLL	28,162 - 29,890	}
	KLX	33,576 - 36,004	}
	KXY	38,97 - 41,95	}
$ec_{1,0\ T}$	(Pr)	103,4527 - 145,4210	21,68 (35)
$ec_{1,0\ K}$	(Pr)	103,4527 (14)	18,5 (3)
$ec_{1,0\ L}$	(Pr)	138,6085 - 139,4790	2,555 (40)
$ec_{1,0\ M}$	(Pr)	143,932 - 144,512	0,539 (8)
$ec_{1,0\ N}$	(Pr)	145,1388 - 145,4410	0,1202 (20)
$\beta^-_{0,1}$	max:	435,0 (11)	69,97 (44)
$\beta^-_{0,1}$	avg:	129,7 (5)	
$\beta^-_{0,0}$	max:	580,4 (11)	30,03 (44)
$\beta^-_{0,0}$	avg:	180,8 (6)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.	
XL	(Pr)	4,458 — 6,617	2,52 (5)	
$XK\alpha_2$	(Pr)	35,5506	4,80 (9)	} $K\alpha$
$XK\alpha_1$	(Pr)	36,0267	8,76 (15)	}
$XK\beta_3$	(Pr)	40,6533 }		
$XK\beta_1$	(Pr)	40,7487 }	2,67 (6)	$K'\beta_1$
$XK\beta''_5$	(Pr)	41,05 }		
$XK\beta_2$	(Pr)	41,774 }		
$XK\beta_4$	(Pr)	41,877 }	0,682 (20)	$K'\beta_2$
$XKO_{2,3}$	(Pr)	41,968 }		

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
$\gamma_{1,0}$(Pr)	145,4433 (14)	48,29 (19)

6 Main Production Modes

$\left\{ \begin{array}{l} Ce-140(n,\gamma)Ce-141 \qquad \sigma : 0{,}58\ (2)\ \text{barns} \\ \text{Possible impurities :}\ Ce-139,\ Ce-143,\ Ce-144 \end{array} \right.$

$Pr-141(n,p)Ce-141$

$La-139(n,\gamma)La-140 \qquad \sigma : 8{,}93\ (4)\ \text{barns}$

$\left\{ \begin{array}{l} La-140(n,\gamma)La-141 \\ \text{Possible impurities :}\ Ce-139 \end{array} \right.$

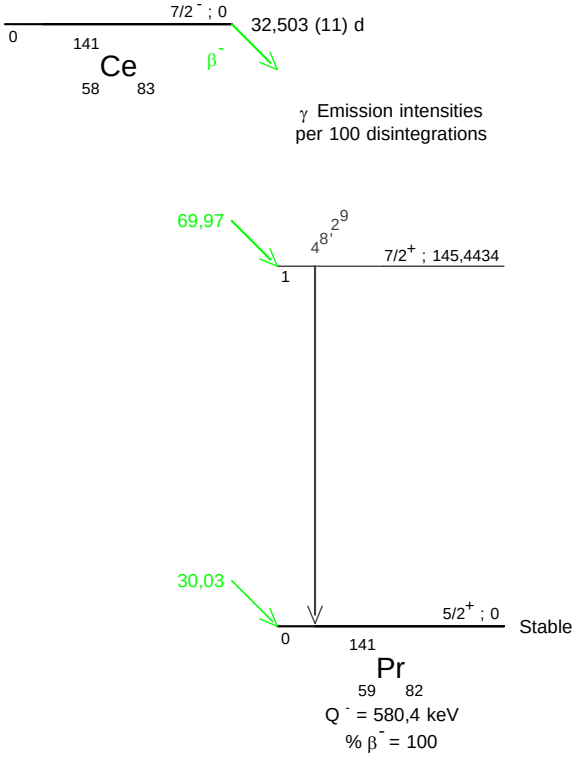
$La-141(\beta^-)Ce-141$

$\left\{ \begin{array}{l} \text{Fission product} \\ \text{Possible impurities :}\ Ce-139,\ Ce-143,\ Ce-144 \end{array} \right.$

7 References

- D. Walker. Proc. Phys. Soc.(london) 62A (1949) 799
  (Half-life)
- M. S. Freedman, and D. W. Engelkemeir. Phys. Rev. 79 (1950) 897
  (Half-life)
- B.H. Ketelle, A.R. Brosi. Priv. Comm. (October 1957). Quoted in Nuclear Data Tables 8 (1957) 115
  (Half-life)
- L. Nemet. Izv. Akad. Nauk SSSR, Ser. Fiz.25 68 (1961)
  (P(KX)/P(g) ratio)
- J.F. Schooley, D.D. Hoppes, A.T. Hirshfeld. J. Res. Nat. Bur. Std 66A (1962) 317
  (E2/M1 mixing ratio)
- J.N. Haag, D.A. Shirley, and David H. Templeton. Phys. Rev. 129 (1963) 1601
  (E2/M1 mixing ratio)
- S.C. Anspach, L.M. Cavallo, S.B. Garfinkel, J.M.R. Hutchinson, C.N. Smith. NP-15663 (1965)
  (Half-life)
- J.S. Eldridge, P. Crowther, W.S. Lyon. Nucleonics 24 (1966) 62
  (g-ray emission probability)
- H.A. O'Brien, Jr., J.S. Eldridge. Nucleonics 25 (1967) 41
  (Half-life)
- K. Debertin. Z. Naturforsch. 26a (1971) 596
  (Half-life)
- S. Baba, H. Baba, H. Natsume. J. Inorg. Nucl. Chem. 33 (1971) 589
  (Half-life)
- J.F. Emery, S.A. Reynolds, E.I. Wyatt, G.I. Gleason. Nucl. Sci. Eng. 48 (1972) 319
  (Half-life)
- J.S. Merritt, J.G.V. Taylor. AECL-4657 (1973) 30
  (Half-life)

- J. Legrand, , J.P. Perolat, C. Bac, J. Gorry. Int. J. Appl. Radiat. Isotop. 26 (1975) 179
  (g-ray emission probability, experimental ICCs)
- R.Vaninbroukx, G.Grosse. Int. J. Appl. Radiat. Isotop. 27 (1976) 727
  (Half-life)
- F.P. Larkins. At. Data Nucl. Data Tables 20 (1977) 311
  (Atomic electron binding energies)
- H.H. Hansen, E. Celen, G. Grosse, D. Mouchel, A. Nylandsted Larsen, R. Vaninbroukx. Z. Physik A290 (1979) 113
  (KX- and g-ray emission probabilities, experimental ICCs)
- H.H. Hansen. Z. Physik A291 (1979) 43
  (Experimental ICCs, E2/M1 mixing ratio)
- U. Schotzig, K. Debertin, K.F. Walz. Nucl. Instrum. Methods 169 (1980) 43
  (g-ray emission probability)
- A.R.Rutledge, L.V.Smith, J.S.Merritt. AECL-6692 (1980)
  (Half-life)
- K.F. Walz, K. Debertin, H. Schrader. Int. J. Appl. Radiat. Isotop. 34 (1983) 1191
  (Half-life)
- E. Schönfeld, H. Janssen, U. Schotzig. (1992)
  (KX- and g-ray emission probabilities, experimental ICCs)
- M.P. Unterweger, D.D. Hoppes,F.J. Schima. Nucl. Instrum. Methods Phys. Res. A312 (1992) 349
  (Half-life)
- E. Schönfeld, H. Janssen. Nucl. Instrum. Methods Phys. Res. A369 (1996) 527
  (Atomic data)
- R.G. Helmer, and C. van der Leun. Nucl. Instrum. Methods Phys. Res. A450 (2000) 35
  (Gamma-ray energy)
- E. Schönfeld, H. Janssen. Appl. Rad. Isotopes 52 (2000) 595
  (Calculation of emission probabilities of X-rays and Auger electrons)
- J. Tuli. Nucl. Phys. A682 (2001) 236c
  (Ce141 decay scheme, Pr141 levels)
- I. M. Band, M. B. Trzhaskovskaya, C. W. Nestor, Jr., P. O. Tikkanen, S. Raman. At. Data Nucl. Data Tables 81 (2002) 1
  (Theoretical ICCs)
- M.P. Unterweger. Appl. Rad. Isotopes 56 (2002) 125
  (Half-life)
- T. Kibedi, T.W. Burrows, M.B. Trzhaskovskaya, P.M. Davidson, C.W. Nestor, Jr.. Nucl. Instrum. Methods Phys. Res. A589 (2008) 202
  (Band-Raman theoretical ICCs)
- M. Wang, G. Audi, A.H.Wapstra, F.G. Kondev, M. MacCormick, X. Xu, B. Pfeiffer. Chines Physics C36 (2012) 1603
  (Q)


7/2⁻ ; 0
32,503 (11) d
0
141
Ce
58
83
β⁻
γ Emission intensities
per 100 disintegrations
69,97
4^8 2^9
7/2⁺ ; 145,4434
1
30,03
5/2⁺ ; 0
Stable
0
141
Pr
59
82
Q⁻ = 580,4 keV
% β⁻ = 100