$$^{58}_{27}\mathrm{Co}_{31}$$

1 Decay Scheme

Co-58 decays 100% by electron capture and beta plus disintegrations to the two first excited levels in Fe-58.

Le cobalt 58 se désintègre à 100 % par capture électronique et transitions bêta plus vers les deux premiers niveaux excités du fer 58.

2 Nuclear Data

$T_{1/2}(^{58}\mathrm{Co}\ )$: 70,85 (3) d
$Q^{+}(^{58}\mathrm{Co}\ )$: 2307,9 (11) keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,2}$	633,2 (11)	1,228 (35)	Allowed	7,7	0,8873 (16)	0,0965 (13)	0,0155 (5)
$\epsilon_{0,1}$	1497,1 (11)	83,83 (16)	Allowed	6,6	0,8885 (16)	0,0955 (13)	0,0153 (5)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,1}$	475,1 (11)	14,94 (16)	Allowed	6,6
$\beta^+_{0,0}$	1285,9 (11)	0,0008 (7)	2nd Forbidden	12,8

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_T	α_π
$\gamma_{1,0}$(Fe)	810,7662 (20)	99,473 (20)	E2	0,000299 (5)	0,0000287 (4)	0,000332 (5)	
$\gamma_{2,1}$(Fe)	863,965 (6)	0,700 (22)	M1+E2	0,000208 (4)	0,0000199 (4)	0,000231 (4)	
$\gamma_{2,0}$(Fe)	1674,731 (6)	0,528 (13)	E2	0,0000577 (8)	0,00000547 (8)	0,000225 (4)	0,0001606 (23)

3 Atomic Data

3.1 Fe

ω_K : 0,355 (4)
$\bar{\omega}_L$: 0,0060 (6)
n_{KL} : 1,447 (4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	6,39091	51,07
	$K\alpha_1$	6,40391	100
	$K\beta_1$	7,0581	20,67
	$K\beta''_5$	7,1083	
X_L			
	$L\ell$	0,617	
	$L\alpha$	0,7075 - 0,7084	
	$L\eta$	0,6306	
	$L\beta$	0,7148 - 0,8454	
	$L\gamma$	0,7284 - 0,7284	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	5,37 - 5,65	100
KLX	6,16 - 6,40	27,4
KXY	6,93 - 7,11	1,87
Auger L	0,52 - 0,84	

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Fe)	0,52 - 0,84	116,9 (7)
e_{AK}	(Fe)		48,8 (4)
	KLL	5,37 - 5,65	
	KLX	6,16 - 6,40	
	KXY	6,93 - 7,11	
$ec_{1,0\ K}$	(Fe)	803,654 (2)	0,0297 (5)
$\beta^+_{0,1}$	max:	475,1 (11)	14,94 (16)
	avg:	201,3 (5)	
$\beta^+_{0,0}$	max:	1285,9 (11)	0,0008 (7)
	avg:		

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Fe)	0,617 - 0,8454	0,609 (18)	
$XK\alpha_2$	(Fe)	6,39091	7,98 (11)	Kα
$XK\alpha_1$	(Fe)	6,40391	15,63 (19)	
$XK\beta_1$	(Fe)	7,0581	3,23 (5)	$K'\beta_1$
$XK\beta''_5$	(Fe)	7,1083		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma^{\pm}$	511	29,88 (32)
$\gamma_{1,0}$(Fe)	810,7602 (20)	99,44 (2)
$\gamma_{2,1}$(Fe)	863,958 (6)	0,700 (22)
$\gamma_{2,0}$(Fe)	1674,705 (6)	0,528 (13)

6 Main Production Modes

$\left\{ \begin{array}{l} \mathrm{Ni-58(n,p)Co-58} \\ \text{Possible impurities : } \mathrm{Ni-63,\ Co-57,\ Co-58m,\ Co-60} \end{array} \right.$

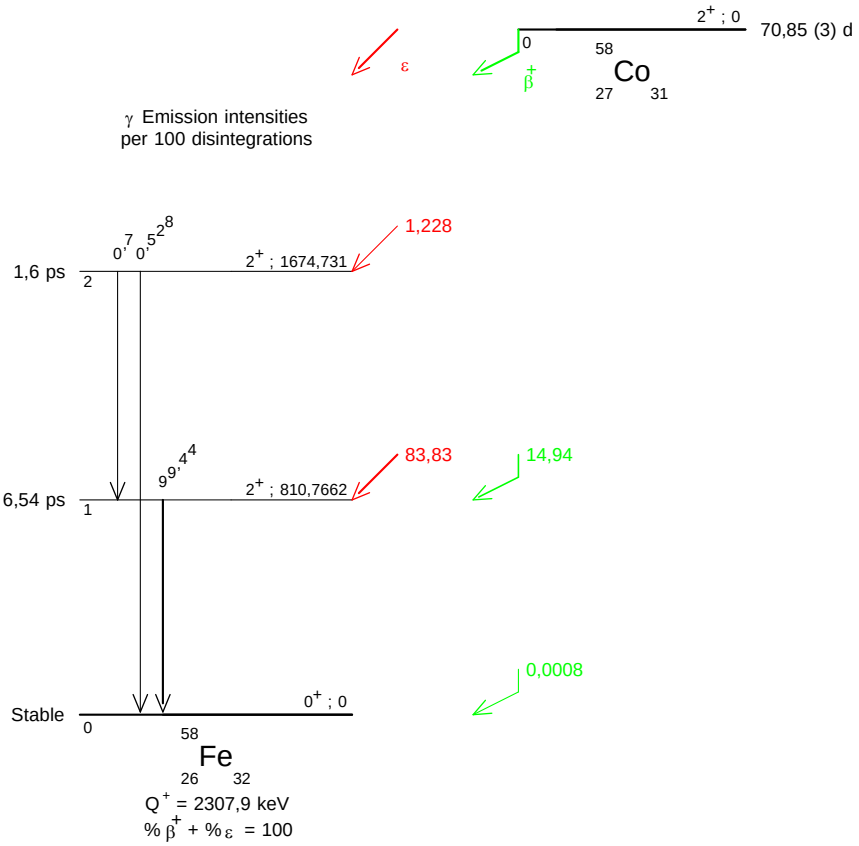
$\left\{ \begin{array}{l} \mathrm{Mn-55}(\alpha\mathrm{,n)Co-58} \\ \text{Possible impurities : none} \end{array} \right.$

$\left\{ \begin{array}{l} \mathrm{Co-59(n,2n)Co-58} \\ \text{Possible impurities : } \mathrm{Fe-59,\ Co-58m,\ Co-60} \end{array} \right.$

7 References

- W.M.Good, D.Peaslee, M.Deutsch. Phys. Rev. 69 (1946) 313
  (Beta plus emission probability)
- L.S.Cheng, J.L.Dick, J.D.Kurbatov. Phys. Rev. 88 (1952) 887
  (K ICC, K/L)
- C.S.Cook, F.M.Tomnovec. Phys. Rev. 104 (1956) 1407
  (Beta plus emission probabilities)
- R.P.Schuman, M.E.Jones, A.C.McWherter. J. Inorg. Nucl. Chem. 3 (1956) 160
  (Half-life)
- M.A.Grace, G.A.Jones, J.O.Newton. Phil. Mag. 1 (1956) 363
  (Beta plus emission probability)
- H.Frauenfelder, H.Levins, A.Rossi, S.Singer. Phys. Rev. 103 (1956) 352
  (Gamma-ray emission probabilities)
- J.Konijn, H.L.Hagedoorn, H.Van Krugten, J.Slobben. Physica 24 (1958) 931
  (Beta plus emission probabilities)
- H.Daniel. Z. Phys. 150 (1958) 144
  (Beta emission probabilities)
- M.K.Ramaswamy. Indian J. Phys. 35 (1961) 610
  (Beta plus emission probabilities)
- D.MacArthur, R.Goodman, A.Artna, M.W.Johns. Nucl. Phys. 38 (1962) 106
  (Gamma-ray emission probabilities)
- W.F.Frey, J.H.Hamilton, S.Hultberg. Ark. Fysik 21 (1962) 383
  (K/L, K ICC)
- R.B.Moler, R.W.Fink. Phys. Rev. 131 (1963) 821
  (PK)
- S.Malmskog. Nucl. Phys. 51 (1964) 690
  (Gamma-ray emission probabilities)
- M.W.Hill. Report BNWL-SA-315 (1965)
  (Gamma-ray emission probabilities)
- R.V.Rama Mohan, K.V.Reddy, B.B.V.Raju, S.Jnanananda. Indian J.Pure Appl.Phys. 4 (1966) 420
  (Mixing ratio)
- E.I.Biryukov, E.G.Zaletskii, N.S.Shimanskaya. Bull. Acad. Sci. USSR 30 (1967) 514
  (Beta plus emission probabilities)
- W.Bambynek, E.De Roost, E.Funck. Proceeding of the Conference on Electron Capture and Higher Order Processes in Nuclear Dec. (Budapest) (1968) 253
  (Gamma-ray emission probabilities, Beta+ emission probabilities, Elec. Capture probabilities)
- J.C.Ritter, R.E.Larson, J.I.Hoover. Nucl. Phys. A110 (1968) 463
  (Gamma-ray emission probabilities)
- P.Decowski, W.Grochulski, A.Marcinkowski, K.Siwek, I.Sledzinska, Z.Wilhelmi. Nucl. Phys. A112 (1968) 513
  (Half-life)
- R.Gunnink, J.B.Niday, R.P.Anderson, R.A.Meyer. Report UCID-15439 (1969)
  (Gamma-ray emission probabilities)
- U.Schötzig, H.Schrader, R.Stippler, F.Munnich. Z. Physik 222 (1969) 479
  (Mixing ratio)
- V.Singh, P.N.Tandon, S.H.Devare, H.G.Devare. Nucl. Phys. A137 (1969) 278
  (Mixing ratio)

- U.Fanger, W.Michaelis, H.Schmidt, H.Ottmar. Nucl. Phys. A128 (1969) 641
  (Mixing ratio)
- A.Williams. Nucl. Phys. A153 (1970) 665
  (Beta plus emission probabilities)
- N.C.Singhal, A.V.Ramayya, J.H.Hamilton, S.Raman. Z. Physik 245 (1971) 50
  (Mixing ratio)
- I.W.Goodier, M.J.Woods, A.Williams. Proc. Int. Conf. Chemical Nuc. Data, Canterbury, M.L. Hurrell Ed. (1971) 175
  (Beta plus emission probabilities)
- D.F.Crisler, H.B.Eldridge, R.Kunselman, C.S.Zaidins. Phys. Rev. C5 (1972) 419
  (Half-life)
- N.C.Dyer, A.C.Rester, W.Croft, J.H.Hamilton. Proc. Int. Conf. Radioactivity in Nucl. Spectrosc., Nashville, Tenn. (1972) 1207
  (Gamma-ray energies and emission probabilities)
- R.A.Fox, W.D.Hamilton, M.J.Holmes. Phys. Rev. C5 (1972) 853
  (Mixing ratio)
- R.Werner, D.C.Santry. J. Nucl. Energy 26 (1972) 403
  (Half-life)
- W.Bambynek, J.Legrand. Atomic Energy Rev. 11 (1973) 524
  (Gamma-ray energies and emission probabilities)
- J.Araminowicz, J.Dresler. Report INR-1464 (1973) 14
  (Half-life)
- F.Lagoutine, F.Legrand, C.Bac. Int. J. Appl. Radiat. Isotop. 26 (1975) 131
  (Half-life)
- R.Vaninbrouck, G.Grosse. Int. J. Appl. Radiat. Isotop. 27 (1976) 727
  (Half-life)
- R.L.Heath. Aerojet Nucl. Co. Report ANCR-1000-2 (1977)
  (Gamma-ray energies and emission probabilities)
- R.C.Greenwood, R.G.Helmer, R.J.Gehrke. Nucl. Instrum. Methods 159 (1979) 465
  (Gamma-ray energies)
- H.Houtermans, O.Milosevic, F.Reichel. Int. J. Appl. Radiat. Isotop. 31 (1980) 153
  (Half-life (Pb-203).)
- A.Grütter. Int. J. Appl. Radiat. Isotop. 33 (1982) 533
  (Gamma-ray energies and emission probabilities)
- D.D.Hoppes, J.M.R.Hutchinson, F.J.Schima, M.P.Unterweger. NBS Special Publication 626 (1982) 85
  (Half-life)
- I.Sykora. Rare Nuclear Processes: Proceedings of the 14th Europhysics Conference on Nuclear Physics, Bratislava, Czecho-Slovakia, 22-26 Oct. 1990 (1992) 141
  (Beta plus emission probabilities)
- V.A.Solé. Nucl. Instrum. Methods A312 (1992) 303
  (K fluorescence yield)
- E.Schönfeld, H.Janssen. Nucl. Instrum. Methods A369 (1996) 527
  (Atomic Data)
- R.G.Helmer, C.Van der Leun. Nucl. Instrum. Methods A450 (2000) 35
  (Gamma-ray energies)
- I.M.Band, M.B.Trzhaskovskaya, C.W.Nestor Jr., P.O.Tikkanen, S.Raman. At. Data Nucl. Data Tables 81 (2002) 1
  (Theoretical ICC)
- G.Audi, A.H.Wapstra, C.Thibault. Nucl. Phys. A729 (2003) 21
  (Asymmetric uncertainties)
- T.Kibédi, T.W.Burrows, M.B.Trzhaskovskaya, P.M.Davidson, C.W.Nestor Jr. Nucl. Instrum. Methods Phys. Res. A589 (2008) 202
  (ICC)
- C.D.Nesaraja, S.D.Geraedts, B.Singh. Nucl. Data Sheets 111 (2010) 897
  (Spin and Parity)
- R.Fitzgerald. J. Res. Natl. Inst. Stand. Technol. 117 (2012) 80
  (Half-life)
- M.Wang, G.Audi, A.H.Wapstra, F.G.Kondev, M.MacCormick, X.Xu, B.Pfeiffer. Chin. Phys. C36 (2012) 1603
  (Q)


2+ ; 0
70,85 (3) d
0
58
Co
27
31
ε
β+
γ Emission intensities
per 100 disintegrations
1,228
0,7 0,5 2,8
1,6 ps
2
2+ ; 1674,731
83,83
14,94
9,9 4,4
6,54 ps
1
2+ ; 810,7662
0,0008
Stable
0
0+ ; 0
58
Fe
26
32
Q+ = 2307,9 keV
%β+ + %ε = 100