



1 Decay Scheme

Mn-54 disintegrates by electron capture via the 835 keV level of Cr-54. An electron capture and a beta plus transition to the ground state of Cr-54 have not been observed but upper limits have been determined. *Le Mn-54 se désintègre par capture électronique vers le niveau à 835 keV du Cr-54. Une capture électronique et une émission bêta plus vers l'état fondamental n'ont jamais été mesurées, mais des limites supérieures ont été déterminées.*

2 Nuclear Data

$T_{1/2}({}^{54}\text{Mn})$:	312,13	(3)	d
$Q^+({}^{54}\text{Mn})$:	1377,1	(10)	keV
$Q^-({}^{54}\text{Mn})$:	697,1	(11)	keV

2.1 β^+ Transitions

	Energy keV	Probability × 100	Nature	lg ft
$\beta_{0,0}^+$	355,1 (10)	0,00000057	Unique 2nd forbidden	13,8

2.2 Electron Capture Transitions

	Energy keV	Probability × 100	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,1}$	542,3 (10)	99,9997 (3)	Allowed	6,17	0,8895 (17)	0,0950 (15)	0,0150 (16)
$\epsilon_{0,0}$	1377,1 (10)	0,0003 (3)	Unique 2nd forbidden	< 13,9	0,8198 (17)	0,0858 (15)	0,0149 (16)

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	$P_{\gamma+ce}$ $\times 100$	Multipolarity	α_K (10^{-4})	α_L (10^{-5})	α_T (10^{-4})
$\gamma_{1,0}(\text{Cr})$	834,845 (5)	99,9997 (3)	E2	2,24 (11)	2,20 (13)	2,51 (11)

3 Atomic Data

3.1 Cr

ω_K	:	0,289	(5)
$\bar{\omega}_L$:	0,0045	(9)
n_{KL}	:	1,508	(5)

3.1.1 X Radiations

	Energy keV	Relative probability	
X_K	$K\alpha_2$	5,405	
	$K\alpha_1$	5,415	
	$K\beta_3$	5,947	}
	$K\beta_1$	5,947	
	$K\beta_5''$		}
X_L	$L\ell$	0,50	
	$L\gamma$	- 0,65	

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	4,554 – 4,794	100
KLX	5,206 – 5,412	26,92
KXY	5,841 – 5,985	1,913
Auger L	0,4 – 0,7	2,91

4 Electron Emissions

		Energy keV	Electrons per 100 disint.
e _{AL}	(Cr)	0,4 - 0,7	143,0 (6)
e _{AK}	(Cr)		63,3 (5)
	KLL	4,554 - 4,794	}
	KLX	5,206 - 5,412	}
	KXY	5,841 - 5,985	}
ec _{1,0 K}	(Cr)	828,849 (5)	0,0224 (11)
ec _{1,0 L}	(Cr)	834,143 - 834,264	0,00220 (13)
$\beta_{0,0}^+$	max:	355,1 (10)	0,00000057
$\beta_{0,0}^+$	avg:	182	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV	Photons per 100 disint.
XL	(Cr)	0,50 — 0,65	0,65 (13)
XK α_2	(Cr)	5,405	7,66 (13) } K α
XK α_1	(Cr)	5,415	15,0 (3) }
XK β_3	(Cr)	5,947	}
XK β_1	(Cr)	5,947	} 3,05 (6) K' β_1

5.2 Gamma Emissions

		Energy keV	Photons per 100 disint.
$\gamma_{1,0}$ (Cr)		834,838 (5)	99,9746 (11)

6 Main Production Modes

{ Fe – 54(n,p)Mn – 54
Possible impurities : Cr – 51, Fe – 55, Fe – 57

{ Cr – 53(d,n)Mn – 54
Possible impurities : V – 48, Mn – 52

V – 51(α ,n)Mn – 54
Cr – 52(t,n)Mn – 54
Cr – 52(α ,d)Mn – 54
Cr – 53(d,n)Mn – 54
Cr – 54(p,n)Mn – 54
Cr – 54(t,He – 3)Mn – 54
Fe – 54(n,p)Mn – 54

7 References

- E.W.BACKOFEN, R.H.HERBER. Phys. Rev. 97 (1955) 743
(Half-life)
- P.KAFALAS, J.W.IRVINE JR.. Phys. Rev. 104 (1956) 703
(Half-life)
- R.P.SCHUMAN, M.E.JONES, A.C.MCWHERTER. J. Inorg. Nucl. Chem. 3 (1956) 160
(Half-life)
- E.I.WYATT, S.A.REYNOLDS, T.H.HANDLEY, W.S.LYONS, H.A.PARKER. Nucl. Sci. and Eng. 11 (1961) 74
(Half-life)
- J.G.V.TAYLOR, J.S.MERRITT. Proc. Intern. Conf. Role of Atomic Electrons in Nuclear Transformations - Warsaw III (1963) 465
(X-ray emission probabilities)
- G.BEN-DAVID. Nucl. Sci. and Eng. 20 (1964) 281
(Half-life)
- W.H.MARIN, D.M.CLARE. Nucl. Sci. and Eng. 19 (1964) 465
(Half-life)
- J.G.V.TAYLOR, J.S.MERRITT. report AECL 2501 (1965) 26
(Half-life)
- K.F.LEISTNER. Atomkerenergie 10 (1965) 311
(X-ray emission probabilities)
- S.C.ANSPACH, L.M.CAVALLO, S.B.GARFINKEL, J.M.R.HUTCHINSON, C.N.SMITH. Report NP 15663 (1965)
(Half-life)
- S.R.SALISBURY, R.A.CHALMERS. Phys. Rev. 140 (1965) B305
(Half-life)
- J.H.HAMILTON, S.R.AMTEY, B.VAN NOOIJEN, A.V.RAMAYYA, J.J.PINAJIAN. Phys. Letters 19 (1966) 682
(ICC)
- M.PETEL, H.HOUTERMANS. Standardization of Radionuclides - IAEA (Vienna) (1967) 301
(X-ray emission probabilities)
- W.BAMBYNEK. Z. Phys. 206 (1967) 66
(X-ray emission probabilities)
- D.BERENYI, D.VARGA, B.VASVARI, E.BRUCHER. Nucl. Phys. A106 (1968) 248
(β^+ emission intensity)
- J.W.HAMMER. Z. Phys. 216 (1968) 355
(X-ray emission probabilities)
- F.LAGOUTINE, Y.LE GALLIC, J.LEGRAND. Intern. J. Appl. Radiat. Isot. 19 (1968) 475
(Half-life)
- W.H.ZIMMER, R.E.DAHL. Nucl. Sci. and Eng. 32 (1968) 132
(Half-life)
- P.BOCK. Report KFK 1116 10/14/71 (1969)
(Half-life)

- C.J.VISSER, J.H.M.KARSTEN, F.J.HAASBROEK, P.G.MARIAS. *Agrochemophysica* 5 (1973) 15
(Half-life)
- P.J.CRESSY JR.. *Nucl. Sci. and Eng.* 55 (1974) 450
(Half-life)
- J.S.MERRITT, J.G.V.TAYLOR. Report AECL 4657 (1974) 30
(Half-life)
- I.M.BAND, M.B.TRZHASKOVSKAYA, M.A.LISTENGARTEN. *Atomic Data and Nuclear Data Tables* 18 (1976) 433
(K and L-shell internal conversion coefficients)
- P.MAGNIER, J.BOUCARD, M.BLONDEL, J.LEGRAND, J.-P.PEROLAT, R.VATIN. *Z. Phys.* A284 (1978) 383, 3
(Fluorescence yield, K X-ray emission intensity)
- J.S.MERRITT, A.R.RUTLEDGE, L.V.SMITH, F.H.GIBSON. Report NEANDC-CAN 51/L (1979) 12
(Half-life)
- D.D.COHEN. *Nucl. Instr. Meth.* 178 (1980) 481
(X-ray emission probabilities)
- A.R.RUTLEDGE, L.V.SMITH, J.S.MERRITT. Report AECL 6692 (1980)
(Half-life)
- D.D.HOPPE, J.M.R.HUTCHINSON, F.J.SCHIMA, M.P.UNTERWEGER. Report NBS-SP 626 (1982) 85
(Half-life)
- A.R.RUTLEDGE, L.V.SMITH, J.S.MERRITT. Report NBS-SP 6262 (1982) 5
(Half-life)
- A.RYTZ. Report NBS-SP- 6262 (1982) 32
(Half-life)
- W.L.ZIJP. Report ECN (Petten) 179 (1985)
(Analysis methodology)
- H.H.HANSEN, EUROPEAN APP.RES.REPERS. *Nucl. Sci. and Technol. EUR 9478 EN 6,4* (1985) 777
(ICC)
- B.SUR, K.R.VOGEL, E.B.NORMAN, K.T.LESKO, R.-M.LARIMER, E.BROWNE. *Phys. Rev. C*39 (1989) 1511
(Half-life)
- M.P.UNTERWEGER, D.D.HOPPE, F.J.SCHIMA. *Nucl. Instr. and Meth.* A312 (1992) 349
(Half-life)
- M.U.RAJPUT, T.D.MAC MAHON. *Nucl. Instr. Meth. A* 312 (1992) 289
(Analysis methodology)
- M.T.F.DA CRUZ, Y.CHAN, A.GARCIA, M.M.HINDI, G.KENCHIAN, R.-M.LARIMER, K.T.LESKO, E.B.NORMAN, R.G.STOKSTAD, F.E.WIETFELDT, I.ZLIMEN. *Phys. Rev. C*48 (1993) 31110
(transition by EC, β^+ decay)
- J.HUO, H.SUN, W.ZHAO, Q.ZHOU. *Nucl. Data Sheets* 68 (1993) 887
(Half-life)
- G.AUDI, A.H.WAPSTRA. *Nucl. Phys. A* 595 (1995) 409
(Q)
- M.A.DUVERNOIS. *Phys. Rev. C*54 (1996) A2134
(Half-life)
- R.H.MARTIN, K.I.W.BURNS, J.V.G.TAYLOR. *Nucl. Instr. and Meth.* A390 (1997) 267
(Half-life)
- B.SINGH, J.L.RODRIGUEZ, S.S.M.WONG, J.K.TULI. *Nucl. Data Sheets* 84 (1998) 487
(log ft systematics)
- R.G.HELMER, C.VAN DER LEUN. *Nucl. Instr. Meth.* A450 (2000) 35
(Gamma ray energy)

