



1 Decay Scheme

K-40 is a natural isotope with an isotopic abundance of 0.0117 (1) %. It disintegrates by beta minus emission to the Ca-40 fundamental level for 89.25 (17) %, by electron capture to the 1460 keV level of Ar-40 for 10.55 (11) %, to the ground state level of Ar-40 for 0.2 (1) % and by beta plus for 0.00100 (12) %.

Le potassium 40 est un isotope naturel dont l'abondance est de 0,0117 (1)%. Il se désintègre pour 89,25 (17) % par émission bêta moins vers le niveau fondamental du calcium 40, par capture électronique vers l'argon 40, pour 10,55 (11) % vers le niveau de 1460 keV et pour 0,2 (1) % vers le niveau fondamental.

2 Nuclear Data

$T_{1/2}({}^{40}\text{K})$:	1,2504	(30)	10^9	a
$Q^+({}^{40}\text{K})$:	1504,69	(19)	keV	
$Q^-({}^{40}\text{K})$:	1311,07	(11)	keV	

2.1 β^- Transitions

	Energy keV	Probability × 100	Nature	lg <i>ft</i>
$\beta_{0,0}^-$	1311,07 (11)	89,25 (17)	Unique 3rd Forbidden	20,58

2.2 β^+ Transitions

	Energy keV	Probability × 100	Nature	lg <i>ft</i>
$\beta_{0,0}^+$	482,9 (3)	0,00100 (12)	Unique 3rd Forbidden	21,35

2.3 Electron Capture Transitions

	Energy keV	Probability × 100	Nature	lg <i>ft</i>	<i>P_K</i>	<i>P_L</i>	<i>P_M</i>
ε _{0,1}	44,0 (3)	10,55 (11)	Unique 1st Forbidden	11,55	0,763	0,209	0,027
ε _{0,0}	1311,07 (11)	0,2 (1)	Unique 3rd Forbidden	21,35	0,88	0,086	0,013

2.4 Gamma Transitions and Internal Conversion Coefficients

	Energy keV	<i>P_{γ+ce}</i> × 100	Multipolarity	α _{<i>K</i>} (10 ⁻⁵)	α _{<i>L</i>} (10 ⁻⁶)	α _{<i>M</i>} (10 ⁻⁷)	α _{<i>T</i>} (10 ⁻⁵)	α _{<i>π</i>} (10 ⁻⁵)
γ _{1,0} (Ar)	1460,822 (6)	10,55 (11)	E2	2,63 (4)	2,15 (3)	2,10 (3)	10,28 (15)	7,3 (5)

3 Atomic Data

3.1 Ar

ω _{<i>K</i>}	:	0,1199	(28)
ω̄ _{<i>L</i>}	:	0,00147	(30)
<i>n_{KL}</i>	:	1,697	(6)

3.1.1 X Radiations

	Energy keV	Relative probability	
X _{<i>K</i>}	Kα ₂	2,95566	
	Kα ₁	2,95774	
	Kβ ₁	3,1905	}
	Kβ'' ₅		}
			16,24
X _{<i>L</i>}	Lℓ	0,2195	
	Lη	0,2215	
	Lβ	0,3112 – 0,3114	

3.1.2 Auger Electrons

	Energy keV	Relative probability
Auger K		
KLL	2,511 – 2,669	100
KLX	2,831 – 2,942	21,6
KXY	3,149 – 3,174	1,16
Auger L	0,17 – 0,31	

4 Electron Emissions

		Energy keV		Electrons per 100 disint.
e _{AL}	(Ar)	0,17	- 0,31	2,22 (2)
e _{AK}	(Ar)			7,24 (11)
	KLL	2,511	- 2,669	}
	KLX	2,831	- 2,942	}
	KXY	3,149	- 3,174	}
ec _{1,0 T}	(Ar)	1457,645	- 1460,835	0,001085 (19)
$\beta_{0,0}^+$	max:	482,9	(3)	0,00100 (12)
$\beta_{0,0}^+$	avg:			
$\beta_{0,0}^-$	max:	1311,07	(11)	89,25 (17)
$\beta_{0,0}^-$	avg:	508,32	(6)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy keV		Photons per 100 disint.
XL	(Ar)	0,2195	— 0,3114	0,003 (1)
XK α_2	(Ar)	2,95566		0,299 (9) } K α
XK α_1	(Ar)	2,95774		0,592 (17) }
XK β_1	(Ar)	3,1905	}	0,096 (4) K' β_1

5.2 Gamma Emissions

	Energy keV	Photons per 100 disint.
γ^{\pm}	511	0,00200 (24)
$\gamma_{1,0}(\text{Ar})$	1460,822 (6)	10,55 (11)

6 References

- G. ORBAN. Sitzb. Akad. Wiss. Wien Abt. IIa 140 (1931) 121
(Partial EC half-life measurement)
- E. GLEDITSCH, T. GRAF. Phys. Rev. 72 (1947) 640
(Partial EC half-life measurement)
- L.H. AHRENS, R.D. EVANS. Phys. Rev. 74 (1948) 279
(Partial Beta- half-life measurement)
- T. GRAF. Phys. Rev. 74 (1948) 831
(Partial Beta- half-life measurement)
- O. HIRZEL, H. WÄFFEL. Phys. Rev. 74 (1948) 1553
(Partial Beta- half-life measurement)
- J.J. FLOYD, L.B. BORST. Phys. Rev. 75 (1949) 1106
(Total half-life measurement)
- R.W. STOUT. Phys. Rev. 75 (1949) 1107
(Partial Beta- half-life measurement)
- G.A. SAWYER, M.L. WIEDENBECK. Phys. Rev. 79 (1950) 490
(Total half-life measurement)
- G.A. SAWYER, M.L. WIEDENBECK. Phys. Rev. 76 (1950) 1535
(Partial EC half-life measurement)
- T. GRAF. Rev. Sci. Inst. 21 (1950) 285
(Partial EC half-life measurement)
- W.R. FAUST. Phys. Rev. 78 (1950) 624
(Total half-life measurement)
- F.G. HOUTERMANS, O. HAXEL, J. HEINTZE. Z. Physik 128 (1950) 657
(Total half-life measurement)
- F.W. SPIERS. Nature 165 (1950) 356
(Total half-life measurement)
- B. SMALLER, J. MAY, M. FREEDMAN. Phys. Rev. 79 (1950) 940
(Partial Beta- half-life measurement)
- C.F.G. DELANEY. Phys. Rev. 81 (1951) 158
(Partial Beta- half-life measurement)
- M.L. GOOD. Phys. Rev. 81 (1951) 891
(Partial Beta- half-life measurement)
- P.R.J. BURCH. Nature 172 (1953) 361
(Partial EC half-life measurement)
- A.D. SUTTLE, W.F. LIBBY. Anal. Chem. 22 (1955) 921
(Partial Beta- and EC half-life measurement)
- S. KONO. J. Phys. Soc. Japan 10 (1955) 495
(Partial Beta- half-life measurement)
- G. BACKENSTOSS, K. GOEBEL. Z. Naturforschg. 10a (1955) 920
(Partial EC half-life measurement)
- G.W. WETHERILL, G.J. WASSERBERG, L.T. ALDRICH, G.R. TILTON, R.J. HAYDEN. Phys. Rev. 103 (1956) 987
(Partial EC half-life measurement)
- A. MCNAIR, R.N. GROVER, H. W. WILSON. Phil. Mag. 1 (1956) 199
(Partial Beta- half-life measurement)

- G.W. WETHERILL. Science 126 (1957) 545
(Partial EC half-life measurement)
- W.H. KELLY, G.B. BEARD, R.A. PETERS. Nucl. Phys. 11 (1959) 492
(Partial Beta- half-life measurement)
- N.K. SAHA, J.B. GUPTA. Proc. Natl. Inst. Sci. India 26A (1960) 486
(Partial Beta- and EC half-life measurement)
- L.E. GLENDENIN. Ann. N.Y. Acad. Sci. 91 (1961) 166
(Partial Beta- half-life measurement)
- D.W. ENGELKEMEIR, K.F. FLYNN, L.E. GLENDENIN. Phys. Rev. 126 (1962) 1818
(Beta+/Beta- ratio measurement)
- D.G. FLEISHMAN, V.V. GLAZUNOV. Sov. At. En. 12 (1962) 338
(Partial Beta- half-life measurement)
- G.A. BRINKMAN, A.H.W. ATEN, JR., J.TH. VEENBOER. Physica 31 (1965) 1305
(Partial Beta- half-life measurement)
- H. LEUTZ, G. SCHULZ, H. WENNINGER. Z. Phys. 187 (1965) 151
(Partial Beta- and EC half-life measurement)
- K. EGELKRAUT, H. LEUTZ. Physik Verhandl. 11 (1966) 67
(Partial Beta- and EC half-life measurement)
- I. FEUERHAKE, A. HINZPETER. Naturwiss. 53 (1966) 272
(Partial Beta- half-life measurement)
- A.W. DERUYTTER, A.H.W. ATEN, JR., A. VAN DULMEN, C. KROL-KONIG, E. ZUIDEMA. Physica 32 (1966) 991
(Partial EC half-life measurement)
- J. D. KING, N. NEFF, H. W. TAYLOR. Nucl. Instrum. Methods 52 (1967) 349
(Gamma-ray energy)
- J. F. W. JANSEN, B. J. MEIJER, P. KOLDEWIJN. Radiochim. Acta 13 (1970) 171
(Gamma-ray energy)
- P. VENKATARAMAIAH, H. SANJEEVAIAH, B. SANJEEVAIAH. Ind. J. Pure Appl. Phys. 9 (1971) 133
(Partial Beta- half-life measurement)
- K. GOPAL, H. SANJEEVAIAH, B. SANJEEVAIAH. Am. J. Phys. 40 (1972) 721
(Partial Beta- half-life measurement)
- A. CESANA, M. TERRANI. Anal. Chem. 49 (1977) 1156
(Partial EC half-life measurement)
- P. SCHLUTER, G. SOFF. At. Data Nucl. Data Tables 24 (1979) 509
(Internal-pair formation coefficient)
- R. G. HELMER, R. J. GEHRKE, R. C. GREENWOOD. Nucl. Instrum. Methods 166 (1979) 547
(Gamma-ray energy)
- P. M. ENDT. Nucl. Phys. A521 (1990) 1
(Spin and Half-life of excited levels)
- P. M. ENDT. Nucl. Phys. A529 (1991) 763
(Spin and Half-life of excited levels)
- P. M. ENDT. Nucl. Phys. A564 (1993) 609
(Spin and Half-life of excited levels)
- E.SCHÖNFELD. Report PTB-6.33-95-2 (1995)
(Electron capture coefficients)
- E. SCHÖNFELD, H. JANSSEN. Nucl. Instrum. Methods A369 (1996) 527
(Atomic Data)
- V.P. CHECHEV. IAEA report INDC(CCP) (2001) 432
(Half-life evaluation)
- F. BEGEMANN, K.R. LUDWIG, G.W. LUGMAIR, K. MIN, L.E. NYQUIST, P.J. PATCHETT, P.R. RENNE, C.-Y. SHIH, I.M. VILLA, R.J. WALKER. Geochim. Cosmochim. Acta 65 (2001) 111
(Uncertainties)
- G. AUDI, A.H. WAPSTRA, C. THIBAUT. Nucl. Phys. A 729 (2003) 337
(Q values)
- K. KOSSERT, E. GÜNTHER. Appl. Rad. Isotop. 60 (2004) 459
(Total half-life measurement)
- T. KIBÉDI, T.W. BURROWS, M.B. TRZHASKOVSKAYA, P.M. DAVIDSON, C.W. NESTOR, JR.. Nucl. Instr. and Meth. A 589 (2008) 202
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