$^{138}_{57}$La $_{81}$

1 Decay Scheme

La-138 decays by an electron capture transition and a β^- decay to the first excited levels of Ba-138 and of Ce-138 respectively.

Le lanthane 138 se désintègre par une transition capture électronique et un bêta moins vers les premiers niveaux excités, respectivement, du baryum 138 et du cérium 138.

2 Nuclear Data

$T_{1/2}$(^{138}La)	:	103,6	(20)	10^9 a
Q^+(^{138}La)	:	1740,0	(34)	keV
Q^-(^{138}La)	:	1051,7	(40)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,1}$	304,2 (34)	65,2 (6)	Unique 2nd Forbidden	17,2	0,637 (5)	0,275 (3)	0,0880 (11)

2.2 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,1}$	263 (4)	34,8 (6)	Unique 2nd Forbidden	18,7

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-4})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{1,0}$(Ce)	788,744 (8)	34,8 (6)	E2	2,91 (4)	4,06 (6)	0,852 (12)	3,42 (5)	
$\gamma_{1,0}$(Ba)	1435,816 (10)	65,2 (6)	E2	0,742 (11)	0,937 (14)	0,192 (3)	0,917 (13)	0,572 (8)

3 Atomic Data

3.1 Ba

ω_K	:	0,900	(4)
$\bar{\omega}_L$	:	0,110	(5)
n_{KL}	:	0,888	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	31,8174	54,28
	$K\alpha_1$	32,1939	100
	$K\beta_3$	36,3045	}
	$K\beta_1$	36,3786	} 29,41
	$K\beta_5''$	36,654	}
	$K\beta_2$	37,258	}
	$K\beta_4$	37,312	} 7,41
	$KO_{2,3}$	37,425	}
X_L			
	$L\ell$	3,9544	
	$L\alpha$	4,4515 - 4,4666	
	$L\eta$	4,3307	
	$L\beta$	4,8278 - 5,207	
	$L\gamma$	5,3715 - 5,8104	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	25,314 - 26,786	100
KLX	30,095 - 32,179	47,7
KXY	34,86 - 37,41	5,7
Auger L	2,66 - 5,81	

3.2 Ce

ω_K	:	0,910	(4)
$\bar{\omega}_L$	:	0,125	(5)
n_{KL}	:	0,876	(4)

3.2.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	34,2793	54,6
	$K\alpha_1$	34,72	100
	$K\beta_3$	39,1705	}
	$K\beta_1$	39,2578	} 30,1
	$K\beta_5''$	39,549	}
	$K\beta_2$	40,233	}
	$K\beta_4$	40,337	} 7,7
	$KO_{2,3}$	40,423	}
X_L			
	$L\ell$	4,2868	
	$L\alpha$	4,822 - 4,8411	
	$L\eta$	4,7274	
	$L\beta$	5,2625 - 5,665	
	$L\gamma$	5,8755 - 6,3412	

3.2.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	27,190 - 28,828	100
KLX	32,392 - 34,700	48,9
KXY	37,57 - 40,40	5,97
Auger L	2,85 - 6,51	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Ba)	2,66 - 5,81	48,8 (4)
e_{AK}	(Ba)		4,16 (18)
	KLL	25,314 - 26,786	}
	KLX	30,095 - 32,179	}
	KXY	34,86 - 37,41	}
e_{AL}	(Ce)	2,85 - 6,51	0,0895 (7)
e_{AK}	(Ce)		0,0091 (5)
	KLL	27,190 - 28,828	}
	KLX	32,392 - 34,700	}
	KXY	37,57 - 40,40	}

		Energy (keV)	Electrons (per 100 disint.)
$ec_{1,0\ K}$	(Ce)	748,301 (8)	0,1010 (22)
$ec_{1,0\ L}$	(Ce)	782,195 - 783,021	0,01409 (32)
$ec_{1,0\ K}$	(Ba)	1398,38 (1)	0,0483 (8)
$\beta^-_{0,1}$	max:	263 (4)	34,8 (6)
	avg:	91,1 (21)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Ba)	3,9544 - 5,8104	6,03 (10)	
XKα_2	(Ba)	31,8174	10,63 (15)	Kα
XKα_1	(Ba)	32,1939	19,58 (26)	
XKβ_3	(Ba)	36,3045	5,76 (10)	K$'\beta_1$
XKβ_1	(Ba)	36,3786		
XKβ_5''	(Ba)	36,654		
XKβ_2	(Ba)	37,258	1,45 (4)	K$'\beta_2$
XKβ_4	(Ba)	37,312		
XKO$_{2,3}$	(Ba)	37,425		
XL	(Ce)	4,2868 - 6,3412	0,01301 (29)	
XKα_2	(Ce)	34,2793	0,0261 (6)	Kα
XKα_1	(Ce)	34,72	0,0478 (11)	
XKβ_3	(Ce)	39,1705	0,0144 (4)	K$'\beta_1$
XKβ_1	(Ce)	39,2578		
XKβ_5''	(Ce)	39,549		
XKβ_2	(Ce)	40,233	0,00365 (12)	K$'\beta_2$
XKβ_4	(Ce)	40,337		
XKO$_{2,3}$	(Ce)	40,423		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Ce)	788,742 (8)	34,7 (6)
$\gamma_{1,0}$(Ba)	1435,795 (10)	65,1 (6)

6 Main Production Modes

{ Naturally occurring
Possible impurities: Ac – 227

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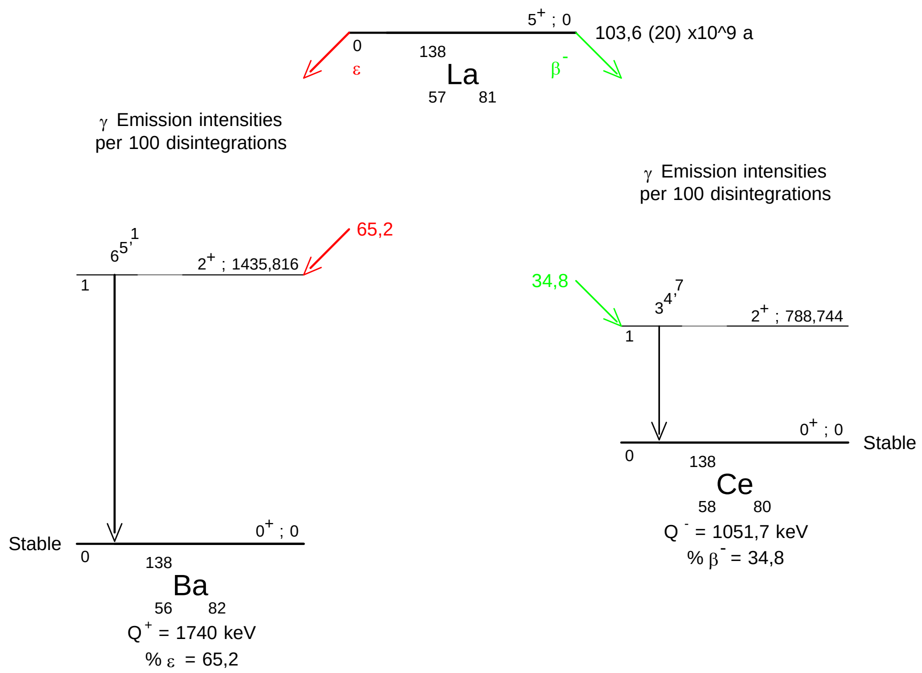
  (Q(β^-) and end-point, β^- spectrum shape, L/K capture ratio)


5+ ; 0
103,6 (20) x10^9 a
0
138
La
57 81
ε
β-
γ Emission intensities
per 100 disintegrations
γ Emission intensities
per 100 disintegrations
65,1
2+ ; 1435,816
1
65,2
34,8
34,7
2+ ; 788,744
1
0+ ; 0
Stable
0
138
Ce
58 80
Q - = 1051,7 keV
% β- = 34,8
Stable
0+ ; 0
0
138
Ba
56 82
Q+ = 1740 keV
% ε = 65,2