

Lanthanum

La

General Information

Discovery

Lanthanum was discovered by C.G. Mosander in 1839 in Stockholm, Sweden.

Appearance

Lanthanum is a silvery-white metal which can be cut with a knife. It is ductile, malleable and tarnishes in air.

Source

Lanthanum is found in 'rare earth' minerals, principally monazite (25% lanthanum) and bastnaesite (38% lanthanum). Ion-exchange and solvent extraction techniques enable the 'rare earth' elements to be isolated from the mineral, and lanthanum is usually obtained by reducing the anhydrous fluoride with calcium.

Uses

'Rare earth' compounds containing lanthanum are used extensively in carbon lighting applications, such as studio lighting and cinema projection. Lanthanum(III) oxide is used in making special optical glasses, as it improves the alkali resistance of glass. The ion lanthanum³⁺ is used as a biological tracer for Ca²⁺, and radioactive lanthanum has been tested for use in treating cancer.

Biological Role

Lanthanum has no known biological role, but both the element and its compounds are moderately toxic.

General Information

Lanthanum is one of the most reactive of the 'rare earth' metals. It oxidises rapidly when exposed to the air, and burns easily. It is attacked slowly by cold water, and rapidly by hot water. It reacts directly with carbon, nitrogen, phosphorus, sulphur, the halogens and some other elements. At room temperature, the structure of lanthanum is hexagonal. This changes to face-centred cubic at 310K, and to body-centred cubic at 865K.

Physical Information

Atomic Number	57
Relative Atomic Mass ($^{12}\text{C}=12.000$)	138.91
Melting Point/K	1194
Boiling Point/K	3730
Density/ kg m^{-3}	6145 (298K)
Ground State Electron Configuration	$[\text{Xe}]5d^1 6s^2$
Electron Affinity (M-M $^-$)/ kJ mol^{-1}	-53

Key Isotopes

Nuclide	^{138}La	^{139}La	^{140}La
Atomic mass	137.9	138.9	
Natural abundance	0.09%	99.91%	0%
Half-life	stable	stable	40.22 h

Ionisation Energies/ kJ mol^{-1}

M - M $^+$	538.1
M $^+$ - M $^{2+}$	1067
M $^{2+}$ - M $^{3+}$	1850
M $^{3+}$ - M $^{4+}$	4819
M $^{4+}$ - M $^{5+}$	6400
M $^{5+}$ - M $^{6+}$	7600
M $^{6+}$ - M $^{7+}$	9600
M $^{7+}$ - M $^{8+}$	11000
M $^{8+}$ - M $^{9+}$	12400
M $^{9+}$ - M $^{10+}$	15900

Other Information

Enthalpy of Fusion/ kJ mol^{-1}	10.04
Enthalpy of Vaporisation/ kJ mol^{-1}	402.1

Oxidation States

La $^{+3}$