

Samarium

Sm

General Information

Discovery

Samarium was discovered by P.E. Lecoq de Boisbaudran in 1879 in Paris.

Appearance

Samarium is a silvery-white metal with a bright sheen.

Source

Samarium is found along with other rare earth metals in several minerals, the principal ones being monazite and bastnaesite. It can be separated from the other components of the mineral by ion exchange and solvent extraction. Recently, electrochemical deposition using lithium citrate as the electrolyte and a mercury electrode has been used to separate samarium from other rare earth elements. Samarium can also be produced by reducing the oxide with barium.

Uses

Samarium is used to dope calcium fluoride crystals for use in optical lasers. It is also used in infrared absorbing glass and as a neutron absorber in nuclear reactors. In common with other rare earth elements, samarium is used in carbon arc lighting for studio lighting and projection.

Biological Role

Samarium has no known biological role, and has low toxicity.

General Information

Samarium is relatively stable in dry air but an oxide coating forms in moist air. The metal ignites in air at 150K.

Physical Information

Atomic Number	62
Relative Atomic Mass ($^{12}\text{C}=12.000$)	150.36
Melting Point/K	1350
Boiling Point/K	2064
Density/kg m ⁻³	7520 (293K)
Ground State Electron Configuration	[Xe]4f ⁶ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	50

Key Isotopes

Nuclide	¹⁴⁴ Sm	¹⁴⁶ Sm	¹⁴⁷ Sm	¹⁴⁸ Sm	¹⁴⁹ Sm	¹⁵⁰ Sm
Atomic mass	143.9	145.9	146.9	147.9	148.9	149.9
Natural abundance	3.1%	0%	15.1%	11.3%	13.9%	7.4%
Half-life	stable	7x10 ⁷ yrs	1.05x10 ¹¹ yrs	12x10 ¹⁴ yrs	1x10 ¹⁵ yrs	stable
Nuclide	¹⁵² Sm	¹⁵³ Sm	¹⁵⁴ Sm			
Atomic mass	151.9		153.9			
Natural abundance	26.6%	0%	22.6%			
Half-life	stable	46.8 h	stable			

Ionisation Energies/kJ mol⁻¹

M - M ⁺	543.3
M ⁺ - M ²⁺	1068
M ²⁺ - M ³⁺	2260
M ³⁺ - M ⁴⁺	3990
M ⁴⁺ - M ⁵⁺	
M ⁵⁺ - M ⁶⁺	
M ⁶⁺ - M ⁷⁺	
M ⁷⁺ - M ⁸⁺	
M ⁸⁺ - M ⁹⁺	
M ⁹⁺ - M ¹⁰⁺	

Other Information

Enthalpy of Fusion/kJ mol ⁻¹	10.9
Enthalpy of Vaporisation/kJ mol ⁻¹	164.8
Oxidation States	
Main	Sm ^{III}
Others	Sm ^{II}
Covalent Bonds/kJ mol⁻¹	
Not applicable	