

Praseodymium

Pr

General Information

Discovery

Praseodymium was first separated from the 'rare earth' didymia by Baron Auer von Welsbach in 1885 in Vienna, Austria. The other component of didymia was neodymium, atomic number 60.

Appearance

Praseodymium is a soft, malleable, silvery metal.

Source

Praseodymium occurs along with other lanthanide elements in a variety of minerals, but the two principal commercial sources of most of these elements are monazite and bastnaesite. The usual techniques employed are ion exchange and solvent extraction, although praseodymium is also prepared by calcium reduction of the anhydrous chloride.

Uses

Praseodymium comprises 5% of the alloy mischmetal, which is used in making products such as cigarette lighters. Along with other lanthanide elements it is used in carbon arcs for studio lighting and projection. Praseodymium is also a component of didymium glass, used by welders and glassmakers, because it filters out the yellow light present in glass blowing. Salts of this element are used to colour glasses and enamels an intense and unusually clean yellow.

Biological Role

Praseodymium has no known biological role, and low toxicity.

General Information

Praseodymium reacts rapidly with water and slowly with oxygen to give a green oxide coating. It is stored under paraffin or sealed in plastic.

Physical Information

Atomic Number	59
Relative Atomic Mass ($^{12}\text{C}=12.000$)	140.91
Melting Point/K	1204
Boiling Point/K	3785
Density/kg m ⁻³	6773 (293K)
Ground State Electron Configuration	[Xe]4f ³ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-50

Key Isotopes

Nuclide	¹⁴¹ Pr	¹⁴² Pr	¹⁴³ Pr
Atomic mass	140.91		
Natural abundance	100%	0%	0%
Half-life	stable	19.2 h	13.59 days

Ionisation Energies/kJ mol⁻¹

M - M ⁺	523.1
M ⁺ - M ²⁺	1018
M ²⁺ - M ³⁺	2086
M ³⁺ - M ⁴⁺	3761
M ⁴⁺ - M ⁵⁺	5543
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 11.3

Enthalpy of Vaporisation/kJ mol⁻¹ 357

Oxidation States

Main Pr⁺³

Others Pr⁺⁴