Promethium Pm

General Information

Discovery

The existence of promethium was predicted by Branner in 1902. In 1945 the element was first produced by the irradiation of neodymium by J.A. Marinsky, L.E. Glendenin and C.D. Coryell in Oak Ridge, USA.

Appearance

Promethium is a radioactive metal. Its salts luminesce in the dark with a pale greenish glow.

Source

Promethium is not found on the planet Earth. It has been identified on Andromeda. It can be produced by the irradiation of neodymium and praseodymium with neutrons, deuterons and alpha particles. It can also be prepared by ion exchange of atomic reactor fuel processing wastes.

Uses

Promethium is used as a nuclear-powered battery as it can capture light in photocells and convert it into an electric current. Such batteries are used in watches, radios and guided-missile instruments. They are no larger than a drawing pin.

Biological Role

Promethium has no known biological role, but is toxic due to its radioactivity.

General Information

Little is known about the properties of promethium.

Physical Information

Atomic Number	61
Relative Atomic Mass (^{12}C=12.000)	145 (radioactive)
Melting Point/K	1441
Boiling Point/K	ca. 3000
Density/kg m^{-3}	7220 (298K)
Ground State Electron Configuration	$[Xe]4f^{5}6s^{2}$
Electron Affinity ($M-M^{-}$)/kJ mol^{-1}	50

Key Isotopes

Nuclide	^{145}Pm	^{146}Pm	^{147}Pm	^{149}Pm	^{151}Pm
Atomic mass	144.9		146.9		
Natural abundance	0%	0%	0%	0%	0%
Half-life	17.7 yrs	4.4 yrs	2.62 yrs	53.1 h	28 h

Ionisation Energies/kJ mol^{-1}

$M - M^{+}$	535.9
$M^{+} - M^{2+}$	1052
$M^{2+} - M^{3+}$	2150
$M^{3+} - M^{4+}$	3970
$M^{4+} - M^{5+}$	
$M^{5+} - M^{6+}$	
$M^{6+} - M^{7+}$	
$M^{7+} - M^{8+}$	
$M^{8+} - M^{9+}$	
$M^{9+} - M^{10+}$	

Other Information

Enthalpy of Fusion/kJ mol^{-1}	12.6
Enthalpy of Vaporisation/kJ mol^{-1}	Not applicable

Oxidation States

Pm^{III}

Covalent Bonds/kJ mol^{-1}

Not applicable