Scandium Sc

General Information

Discovery

Scandium was discovered by L.F. Nilson in 1879 in Uppsala, Sweden. It was, however, predicted by Mendeleev who named it ekaboron.

Appearance

Scandium is a soft, silvery-white metal, which becomes slightly tinged with yellow or pink upon exposure to the air.

Source

Scandium is the 50th most abundant element on the earth. It is very widely distributed, and occurs in minute quantities in over 800 mineral species.

In the rare mineral thortveitite, however, which is found in Scandinavia, it is the principal component.

Scandium can be recovered from thortveitite or extracted as a by-product from uranium mill tailings. Metallic scandium can also be prepared by electrolysing a eutectic melt of potassium, lithium and scandium chlorides, with electrodes of tungsten wire and a pool of molten zinc.

Uses

Scandium is not widely used. Scandium iodide is added to mercury vapour lamps to produce a highly efficient light source resembling sunlight, which is important for indoor and night-time colour television transmission. The radioactive isotope ^{46}Sc is used as a tracing agent in refinery crackers for crude oil. However, the potential for scandium is very great indeed because it is almost as light as aluminium and has a much higher melting point, so has attracted the interest of space missile designers.

Biological Role

Scandium has no known biological role, but is a suspected carcinogen.

General Information

Scandium is a much more abundant element in the sun and in certain stars than here on earth. The blue colour of beryl (the aquamarine variety) is attributed to scandium.

Physical Information

Atomic Number	21
Relative Atomic Mass (^{12}C=12.000)	44.956
Melting Point/K	1814
Boiling Point/K	3104
Density/kg m^{-3}	2989 (273K)
Ground State Electron Configuration	$[Ar]3d^{1}4s^{2}$
Electron Affinity (M-M^{-})/kJ mol^{-1}	-70

Key Isotopes

Nuclide	^{44}Sc	^{45}Sc	^{46}Sc	^{47}Sc
Atomic mass		44.956	45.955	
Natural abundance	0%	100%	0%	0%
Half-life	3.92 h	stable	83.80 days	3.34 days

Ionisation Energies/kJ mol^{-1}

M - M^{+}	631
M^{+} - M^{2+}	1235
M^{2+} - M^{3+}	2389
M^{3+} - M^{4+}	7089
M^{4+} - M^{5+}	8844
M^{5+} - M^{6+}	10720
M^{6+} - M^{7+}	13320
M^{7+} - M^{8+}	15310
M^{8+} - M^{9+}	17369
M^{9+} - M^{10+}	21740

Other Information

Enthalpy of Fusion/kJ mol^{-1}	15.9
Enthalpy of Vaporisation/kJ mol^{-1}	376.1

Oxidation States

Sc^{II}, Sc^{III}

Covalent Bonds/kJ mol^{-1}

Not applicable