

Scandium - Sc

Chemical properties of scandium - Health effects of scandium - Environmental effects of scandium

Atomic number	21
Atomic mass	44.9559 g.mol ⁻¹
Electronegativity according to Pauling	unknown
Density	3.0 g.cm ⁻³ at 20°C
Melting point	1541 °C
Boiling point	2836 °C
Vanderwaals radius	0.161 nm
Ionic radius	0.083 nm (+3)
Isotopes	7
Electronic shell	[Ar] 3d ¹ 4s ²
Energy of first ionisation	640.5 kJ.mol ⁻¹
Energy of second ionisation	1233 kJ.mol ⁻¹
Energy of third ionisation	2389 kJ.mol ⁻¹
Energy of fourth ionisation	7089 kJ.mol ⁻¹
Discovered by	Lars Nilson in 1879



Scandium

Scandium is a soft, silvery transition element which occurs in rare minerals from Scandinavia. It develops a slightly yellowish or pinkish cast when exposed to air. Scandium tarnishes in air and burns easily, once it has been ignited. It reacts with water to form hydrogen gas and will dissolve in many acids. Pure scandium is produced by heating scandium fluoride (ScF₃) with calcium metal.

Applications

Scandium is one of the rare chemicals, that can be found in houses in equipment such as colour televisions, fluorescent lamps, energy-saving lamps and glasses. The use of scandium is still growing, due to the fact that it is suited to produce catalysers and to polish glass. The main application by volume is in aluminium-scandium alloys for the aerospace industry and for sports equipment (bikes, baseball bats, etc.) which rely on high performance materials. It has been shown to reduce solidification cracking during the welding of high strength aluminium alloys.

Scandium in the environment

Scandium can rarely be found in nature, as it occurs in very small amounts. Scandium is usually found only in two different kinds of ores. Thortveitite is the primary source of scandium with uranium mill tailings by-products also being an important source. World production amounts to only 50 kg per year. There is no estimate of how much is potentially available.

Scandium is only the 50th most abundant element on earth, it is distributed widely, occurring in trace quantities in over 800 minerals. The blue color of the aquamarine variety of beryl is thought to be caused by scandium.

Only about 3% of plants that were analysed for scandium shows its presence, and even those amounts were tiny, with vegetables having only 5 ppb although grass has 70 ppb.

Health effects of scandium

Scandium has no biological role. Only trace amounts reach the food chain, so the average person's daily intake is less than 0.1 microgram.

Scandium is not toxic, although there have been suggestions that some of its compounds might be cancerogenic.

Scandium is mostly dangerous in the working environment, due to the fact that fumes and gasses can be inhaled with air. This can cause lung embolisms, especially during long-term exposure. Scandium can be a threat to the liver when it accumulates in the human body.

Effects of scandium on the environment

Scandium is dumped in the environment in many different places, mainly by petrol-producing industries. It can also enter the environment when household equipment is thrown away.