

Tantalum

Ta

General Information

Discovery

Tantalum was discovered by A.G. Ekeberg in 1802 in Uppsala, Sweden, but many chemists thought that tantalum and niobium were identical elements until Rose (in 1844) and Marignac (in 1866) showed that niobic and tantalic acids were different.

Appearance

Tantalum is a shiny, grey metal which is soft when pure.

Source

Tantalum occurs principally in the mineral columbite-tantalite, found in many places including Australia, Canada and Africa. Separation of tantalum from niobium requires several complicated steps. It is obtained commercially as a by-product of tin extraction.

Uses

Tantalum causes no immune response in mammals, so has found wide use in the making of surgical appliances. It can replace bone, for example in skull plates; as foil or wire it connects torn nerves; as woven gauze it binds abdominal muscle. Tantalum has also been used to make a variety of alloys.

Biological Role

Tantalum has no known biological role, and is non-toxic.

General Information

Tantalum is very corrosion resistant due to the formation of an oxide film, but is attacked by hydrogen fluoride and fused alkalis. It has a melting point exceeded only by tungsten and rhenium.

Physical Information

Atomic Number	73
Relative Atomic Mass ($^{12}\text{C}=12.000$)	180.95
Melting Point/K	3269
Boiling Point/K	5698
Density/kg m ⁻³	16654 (293K)
Ground State Electron Configuration	[Xe]4f ¹⁴ 5d ³ 6s ²
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-14

Key Isotopes

Nuclide	¹⁸⁰ Ta	¹⁸¹ Ta	¹⁸² Ta
Atomic mass	179.9	180.9	
Natural abundance	0.012%	99.99%	0%
Half-life	1x10 ¹² yrs	stable	115.1 days

Ionisation Energies/kJ mol⁻¹

M - M ⁺	761
M ⁺ - M ²⁺	1500
M ²⁺ - M ³⁺	2100
M ³⁺ - M ⁴⁺	3200
M ⁴⁺ - M ⁵⁺	4300
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	31.4
Enthalpy of Vaporisation/kJ mol ⁻¹	758.2

Oxidation States

Main	Ta ⁺⁵
Others	Ta ⁻³ , Ta ⁻¹ , Ta ⁺¹ , Ta ⁺² , Ta ⁺³ , Ta ⁺⁶