Technetium *Tc*

General Information

Discovery

Technetium was discovered by C. Perrier and E.G. Segre in 1937 in Palermo, Italy. It was the first element to be produced artificially.

Appearance

Technetium is a silvery-grey metal that tarnishes slowly in moist air. It is usually obtained as a grey powder.

Source

The metal is produced in tonne quantities from the fission products of uranium nuclear fuel.

Uses

The gamma ray emitting technetium-99m (metastable) is widely used for diagnostic studies. Several chemical forms are used to image different parts of the body.

Technetium is a remarkable corrosion inhibitor for steel, and can protect steel by the addition of very small amounts. This use is limited to closed systems as technetium is radioactive.

Biological Role

Technetium has no known biological role. It is toxic as a radioactive element

General Information

Technetium is an excellent superconductor at 11 K and below. It resists oxidation, burns in oxygen and reacts with nitric and sulphuric acids.

Physical Information

Atomic Number	43
Relative Atomic Mass (^{12}C=12.000)	98.91
Melting Point/K	2445
Boiling Point/K	5150
Density/kg m^{-3}	11500 (293K)
Ground State Electron Configuration	$[Kr]4d^5 5s^2$
Electron Affinity (M-M^-)/kJ mol^{-1}	-96

Key Isotopes

Nuclide	^{97}Tc	^{98}Tc	^{99}Tc
Atomic mass		97.911	98.90
Natural abundance	0%	0%	0%
Half-life	$2.6x10^6$yrs	$1.5x10^6$ yrs	$2.12x10^5$ yrs

Ionisation Energies/kJ mol^{-1}

M - M^+	702
M^+ - M^{2+}	1472
M^{2+} - M^{3+}	2850
M^{3+} - M^{4+}	4100
M^{4+} - M^{5+}	5700
M^{5+} - M^{6+}	7300
M^{6+} - M^{7+}	9100
M^{7+} - M^{8+}	15600
M^{8+} - M^{9+}	17800
M^{9+} - M^{10+}	19900

Other Information

Enthalpy of Fusion/kJ mol^{-1}	23.81
Enthalpy of Vaporisation/kJ mol^{-1}	585.22

Oxidation States

Main	Tc^{+4}, Tc^{+5}, Tc^{+7}
Others	Tc^{-1}, Tc^0, Tc^{+6}