

Isotopes of Thorium

Isotope	Atomic Mass	Half-life	Mode of Decay	Nuclear Spin	Nuclear Magnetic Moment
Th-227	227.027699	18.72 days	α to Ra-223	3/2	No data available
Th-228	228.028731	1.913 years	α to Ra-224; O-20	0	No data available
Th-229	229.031754	7900 years	α to Ra-225	5/2	0.46
Th-230	230.033126	75,400 years	α to Ra-226; SF	0	No data available
Th-231	231.036296	1.063 days	α to Ra-227; β - to Pa-231	5/2	No data available
Th-232	232.0380508	1.4×10^{10} years	α to Ra-228; SF	0	No data available
Th-233	233.041576	22.30 minutes	β - to Pa-233	1/2	No data available
Th-234	234.036596	24.10 days	β - to Pa-234	0	No data available



Thorium was discovered in 1828 by the Norwegian mineralogist Morten Thrane Esmark and identified in 1829 by the Swedish chemist Jöns Jakob Berzelius. It is named after Thor, the mythological Scandinavian god of war.

Thorium is a grayish-white lustrous metal that is soft when pure and is quite ductile and malleable. It can be shaped by cold or hot rolling, swaging or drawing. It is dimorphic with face-centered cubic crystals, changing to a body-centered cubic structure at 1400 °C. It is soluble in hydrochloric and sulfuric acids and *aqua regia*, slightly soluble in nitric acid, and insoluble in water. Thorium combines with practically all nonmetallic elements except the noble gases, forming binary compounds. It combines with nitrogen at elevated temperatures to form ThN and Th₂N₃. Thorium reacts with all halogens, forming tetrahalides. At elevated temperatures, thorium also forms inter-metallic compounds with iron, copper, aluminum, selenium, nickel, cobalt, manganese, bismuth and many other metals.

The principal use of thorium is as a nuclear fuel. Another major application is the Welsbach incandescent mantle used in portable gaslights. Alloyed with magnesium, thorium imparts high strength and creep resistance to the magnesium at elevated temperatures. Such alloys are used in vehicles and aerospace equipment. Thorium oxide-coated tungsten filaments are used in incandescent lamps, and rods are employed as electrodes in arc-melting. Other uses are in photoelectric cells, as a target in x-ray tubes, and as a reducing agent in metallurgy.

All thorium isotopes are radioactive. All of its intermediate decay products, including Radon-220, are radioactive and present radiation hazard. Exposure can cause cancer.

Properties of Thorium

Name	Thorium
Symbol	Th
Atomic number	90
Atomic weight	232.03806
Standard state	Solid at 298 °K
CAS Registry ID	7440-29-1
Group in periodic table	N/A
Group name	Actinoid
Period in periodic table	7 (Actinoid)
Block in periodic table	f-block
Color	Silvery white
Classification	Metallic
Melting point	1750 °C
Boiling point	4820 °C
Vaporization point	4788 °C
Thermal conductivity	54.00 W/(m·K)
Electrical resistivity	$15 \times 10^{-8} \Omega \cdot m$
Electronegativity	1.3
Specific heat	0.13 kJ/kg K
Heat of vaporization	$530.00 \text{ kJ} \cdot \text{mol}^{-1}$
Heat of fusion	$16.00 \text{ kJ} \cdot \text{mol}^{-1}$
Density of solid	11.72 g/cm^3
Electron configuration	$[\text{Rn}]6d^2 7s^2$
Atomic radius	1.80 Å
Ionic radius	Th ⁴⁺ : 1.05 Å (coordination number 8)
Most stable oxidation state	+4