Stable isotopes of hafnium available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Hf-174	72	102	173.940042	0.162%	13.46%	Oxide
Hf-176	72	104	175.941406	5.260%	84.60%	Oxide
Hf-177	72	105	176.943220	18.606%	85.40%	Oxide
Hf-178	72	106	177.943698	27.297%	92.40%	Oxide
Hf-179	72	107	178.945815	13.629%	75.00%	Oxide
Hf-180	72	108	179.946549	35.100%	≥94.60%	Oxide

Hafnium was discovered in 1923 by Dirk Coster and George Charles von Hevesy. Its name derives from the Latin name *Hafnia,* meaning “Copenhagen.”

Hafnium is generally similar to zirconium. It has gray crystals, good corrosion resistance and high strength. It occurs as a close-packed hexagonal alpha form and as a body-centered cubic beta modification. It has a magnetic susceptibility of 0.42 x 10^{-6} emu/g at 25 ºC. It is insoluble in water, dilute mineral acids and nitric acid at all concentrations, and is soluble in hydrofluoric acid, concentrated sulfuric acid and *aqua regia*. The metal in bulk form does not react with most reagents at ordinary temperatures; however, the powdered metal or hafnium sponge may readily burn in air after being ignited with a spark. When heated to 360 ºC under water pressure, the metal is oxidized to hafnium oxide, forming a thin, protective surface oxide layer. Reaction with hydrofluoric acid at ordinary temperatures yields hafnium tetrafluoride. In finely divided form, hafnium is pyrophoric, igniting in air spontaneously; however, bulk metal reacts slowly in oxygen or air above 400 ºC. Reaction with hydrogen occurs around 700 ºC.

Hafnium is used in control rods for nuclear reactors. It has high resistance to radiation, as well as very high corrosion resistance. Another major application is in alloys with other refractory metals, such as tungsten, niobium and tantalum.

Properties of Hafnium

Name	Hafnium
Symbol	Hf
Atomic number	72
Atomic weight	178.49

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Properties of Hafnium (continued)

Standard state	Solid at 298 ºK
CAS Registry ID	7440-58-6
Group in periodic table	4
Group name	None
Period in periodic table	6
Block in periodic table	d-block
Color	Gray steel
Classification	Metallic
Melting point	2233 °C
Boiling point	4602 °C
Vaporization point	2233 ºC
Thermal conductivity	0.230 W/(m·K) at 298.2 ºK
Electrical resistivity	35.1 μΩ·cm at 25 ºC
Electronegativity	1.3
Specific heat	0.14 kJ/kg K
Heat of vaporization	630 $kJ \cdot mol^{-1}$ at 4602 ºC
Heat of fusion	25.5 $kJ \cdot mol^{-1}$ mole
Density of liquid	12 g/cm^3 at 2233 °C
Density of solid	13.31 g/cm^3
Electron configuration	$[Xe]4f^{14}5d^26s^2$
Atomic radius	1.442 Å
Common oxidation state	+4 (also exhibits oxidation states +2 and +3)

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