



>>Entry Name: Hafnium

CAS Registry Number: 7440-58-6

Hf

Molecular Formula: Hf

Molecular Weight: 178.49

Accurate Mass: 179.946545

Percentage Composition: Hf 100.00%

General Statement: Atomic No. 72. Ground state electron config. $[\text{Xe}]4f^{14}5d^26s^2$. Discovered in 1922-1923 by D. Coster and G. von Hevesy. 19 Isotopes known 6 of which are natural. Abundance: 2.8 ppm (earth's crust). Always associated with Zr. α -Form (hcp) transforms into the β -form (bcc) at 1760°. No biological role

Source/Synthesis: Occurs mostly in Zr minerals, esp. zircon, but alvite ($\text{MSiO}_4 \cdot x\text{H}_2\text{O}$, $M = \text{Zr/Hf}$) sometimes contains >50% Hf. Separated from Zr by solvent extraction and HfCl_4 reduced by Mg in the Kroll process. Metal may be obt. from $\text{HfO}_2 + \text{Ca}$; $\text{K}_2\text{HfF}_6 + \text{Na}$; $\text{HfCl}_4 + \text{Na}$ or Mg; or by heating HfI_4

Use/Importance: Hf has limited uses: its large neutron capture cross-section leads to uses in control of reactors. World output is rather small

Physical Description: Lustrous, silvery, ductile metal. Resists extensive atmospheric corrosion because of oxide film. Not attacked by cold mineral acids (except HF) or alkalis

Melting Point: Mp 2503° (2467°)

Boiling Point: Bp 4450°

Hazard & Toxicity: Pyrophoric when finely divided. Damp metal may burn explosively. Metal may explode in presence of P, S or halogens. ^{174}Hf is an α emitter

Aldrich: 26678-7

Fluka: 51300

>>Variant: Hafnium 168

CAS Registry Number: 14922-71-5

General Statement: Radioactive, $t_{1/2}$ 25.95 min.

Source/Synthesis: Prod. from ^{175}Lu (p,8n), ^{170}Yb (α ,6n), or ^{170}Yb (^3He ,5n). Daughter of ^{168}Ta

Other Data: $I = +0$. Decays by orbital electron capture or $\beta^{(+)}$ emission to ^{168}Lu

>>Variant: Hafnium 170

CAS Registry Number: 14922-51-1

General Statement: Radioactive, $t_{1/2}$ 16.01 h

Source/Synthesis: Prod. from ^{175}Lu (p,6n), ^{171}Yb (α ,5n), or by bombardment of Yb with ^3He

Other Data: $I = +0$. Decays by orbital electron capture to ^{170}Lu

>>Variant: Hafnium 172

CAS Registry Number: 14093-11-9

General Statement: Radioactive, $t_{1/2}$ 1.87 y

Source/Synthesis: Prod. from ^{175}Lu (p,4n), or by bombardment of Yb with α -particles

Other Data: $I = +0$. Decays by orbital electron capture to ^{172}Lu

>>Variant: Hafnium 173

CAS Registry Number: 15757-23-0

General Statement: Radioactive, $t_{1/2}$ 23.6 h

Source/Synthesis: Prod. from ^{175}Lu (p,3n), or by bombardment of Yb with α -particles

Other Data: $I = -1/2$. Decays by orbital electron capture to ^{173}Lu

>>Variant: Hafnium 174

CAS Registry Number: 14922-49-7

General Statement: Stable. Natural abundance 0.1621-0.1619 atom %

Other Data: $I = +0$

>>Variant: Hafnium 175

CAS Registry Number: 15750-13-7

General Statement: Radioactive, $t_{1/2}$ 70 d

Source/Synthesis: Prod. from ^{174}Hf (n, γ), ^{175}Lu (d,2n), or ^{175}Lu (p,n)

Other Data: $I = -5/2$; $\mu = 0.54 \mu_N$. Decays by orbital electron capture to ^{175}Lu