

The perfect solution for a wide range of industries

### Challenge

Beyond our core business of providing semi-products and components for the nuclear industry, we also provide metals, chlorides and oxides for non-nuclear markets.

Hafnium is by-product of manufacturing of zirconium material. Framatome manufacturing miles of Zirconium tubes every year and has enough quantity of hafnium to support various customers.

Today hafnium is a key contributor to applications in the semi-conductor industry, in fine chemistry, in aerospace and in medical fields.

### Hafnium applications

#### Aerospace, Gas Turbines & Turbochargers

Hafnium is widely used nowadays as alloying elements in variety of metallurgies (Ti, Ni, Nb, Al, Cu, Mg..) in high tech applications to boost advanced mechanical performances especially at high temperature.

Main area of interest is the sector of titanium, nickel and tantale based super alloys for the aircraft industry, gas turbines, automotive turbochargers, rockets...

Niobium-hafnium alloy is commonly used in the aerospace industry. Tantalum-tungsten alloy containing hafnium has a high creep strength and can be used as a protective layer material for spacecraft.

#### Plasma cutting

Hafnium metal due to its very high melting point is widely used in the stainless steel industry for plasma cutting torch tips.

#### Thin film coating

Thanks to its properties hafnium is commonly used in coatings such as Chemical Vapor Deposition (CVD) and Physical Vapor Deposition (PVD).



Hafnium Crystal Bar

### Customer benefits

- Expertise
- Wide products portfolio
- Quality
- Security

**Your performance**  
is our everyday **commitment**

## Hafnium use in fine chemistry and optical applications

### HfCl<sub>4</sub>

Hafnium chloride (HfCl<sub>4</sub>) is commonly used in fine chemistry as a support for catalyst.

As part of the development of the polymer industry with increasingly sophisticated plastics, hafnium chloride is proving to be perfectly suited to the catalyst industry with a range of very pure products serving as a support for metallocene catalysts.

### HfO<sub>2</sub>

Hafnium oxide (HfO<sub>2</sub>) is regarded as one of the most commonly used high index coating materials for optical components.

Thanks to a high refractive index and a wide region of low absorption from the near-UV to the mid-IR, hafnium oxide is the perfect material usable for optical coatings.

Indeed, thin deposits of hafnium oxide provide hard, scratch-free coatings for applications such as near-UV laser, anti-reflective and dielectric mirror.



Hafnium chloride (HfCl<sub>4</sub>)

### Customer benefits

- Very low level of residual impurities coming from our separation process
- Complete traceability



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