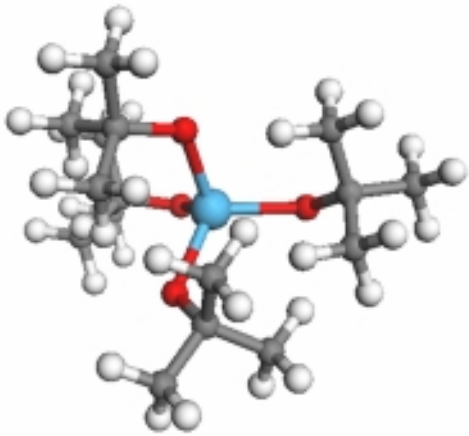


ALOHA™ CVD/ALD Materials



HTB

Hafnium Tertiary Butoxide

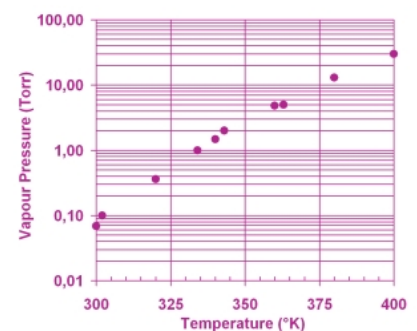
$\text{Hf}[\text{O}-\text{C}(\text{CH}_3)_3]_4$

CAS n°2172-02-3

- HTB is used essentially for the deposition of pure HfO_2 or as a mixed oxide of other elements such as Silicon, Aluminum, Zirconium, Titanium, Tantalum, or others.
- HTB is essentially used in MOCVD mode for the deposition of high-k films.
- HTB is a clear liquid that reacts immediately upon contact with water or moisture (white fumes in air), with the evolution of terbutanol. Except for TDMAH, HTB is the most volatile among the usual Hafnium precursors.
- Like for most of the ALOHA advanced products, each canister of HTB is supplied with a BALAZS CofA ensuring strict compliance with the specifications. Please consult www.balazs.com for more information on Air Liquide's BALAZS analytical services.
- Beside semiconductor application, high purity Hafnium is used in the nuclear industry for control rods. Lower purity material is used for alloying and gettering applications. Hafnium is essentially a "by-product" of Zirconium purification.

Physical Chemical Properties

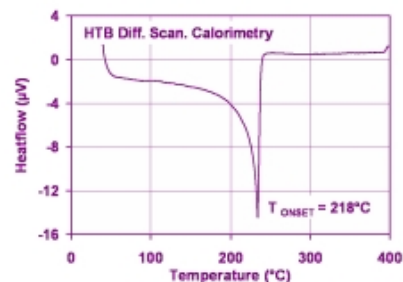
Physical Property	
Molecular Weight	470.65 g/mol
Physical State	Liquid
Colour	Colourless
Melting Point	8°C
Vapour Pressure	1 torr @ 61°C
Enthalpy of vaporization	15 kcal/mol @50°C
Specific Gravity	1.15 g/cm ³



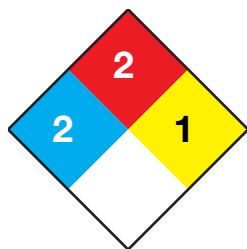
ALOHA Specifications

Parameter	Unit	Specification
Assay	%	>99%
Water Content	ppm	Reacts
Total Chloride	ppm	<=5

Please consult ALOHA™ for detailed metals and additional specifications. This product comes under low volume manufacturing control plan.



Hazard Rating



HMIS

Health: 2
Flammability: 2
Reactivity: 1

The product should be handled considering that the major by-product in case of air exposure is terbutanol. Please consult the ALOHA MSDS of HTB for additional data.

Packaging & Dispensing System

- HTB can be packaged in a variety of canisters depending on the application.
- For on-board applications, HTB is usually supplied in 1200, 1800 or 2500 ml canisters with various valving and dip-tube configurations. Multipoint or continuous level sensing systems can also be customized to meet each specific requirements. ALOHA's on-board canisters have all-metal construction and are cleaned and dried by state of the art techniques. HTB can also be filled in properly documented customer-supplied canisters.
- HTB can be conveniently distributed from a liquid dispense system such as the Air Liquide CANDI. In this case, please consult ALOHA for canister configuration.
- Since HTB has a very low vapour pressure at room temperature, the solvent purge option for the Air Liquide CANDI system is mandatory. ALOHA's UHP Hexane or Octane undergo a proprietary drying process for this application. For the cleaning of on-board manifold and direct exhaust to the tool, a new and harmless high volatility solvent can be proposed.



Transport Information

- Proper shipping name: Organometallic substance, water reactive, flammable, n.o.s. (Tetrakis(tertiarybutoxy)Hafnium)
- CAS n° 2172-02-3
- UN Number: 3399
- Class/division: 4.3
- Package group: II
- Hazard Labels required : Class 4.3 (Dangerous When Wet), Class 3 (Flammable)



Air Liquide ALOHA is providing a complete advanced precursor solution. ALOHA portfolio covers low k, high k, barrier, metal gate, electrode, including some proprietary solutions for SiN, metals and High k. Manufacturing electronic devices with this material may be claimed in certain patents and seller hereby disclaims any liability as to the use of this material made by buyer.

For more information please contact: aloha@airliquide.com or your local Air Liquide representative.



ALOHA
ELECTRONICS PERFORMANCE MATERIALS