

## ***Advanced Titanium Precursors***

### ***Description***

Air Products offers a series of advanced Ti precursors for deposition of High K and Ultra High K dielectric films. These closely related compounds allow you to tailor the precursor to suit your processing requirements by selecting for properties such as deposition temperature, deposition rate, vapor pressure, etc. These precursors represent a technological advance over conventional precursors, such as TDMAT, in their ability to deposit films at relatively high temperatures in a self-limiting ALD mode.

### ***Properties:***

- Pale yellow liquids or solids at room temperature
- Soluble in organic solvents, hydrolyzed in water
- Suitable for DLI, vapor draw or bubbling
- Vapor pressure approximately 0.1 torr @ 100-125°C
- Deposition rates approximately 0.4 Å/cycle in self-limiting ALD mode
- Deposition temperatures up to 400°C in self-limiting ALD mode

### ***Applications***

Titanium containing dielectrics are required for a number of High K applications, such as DRAM capacitors and transistor gate dielectrics. The dielectric may be a simple TiO<sub>2</sub> film, a complex stoichiometric material such as STO, or a mixed oxide of tuned composition. Air Products has developed a series of advanced precursors to enable deposition of Ti-containing dielectrics by CVD or ALD, typically in thermal processes employing O<sub>3</sub> or H<sub>2</sub>O as the oxidant. The precursor may be introduced to the process either by direct evaporation or by direct liquid injection through a suitable vaporizer. Air Products technologists are available to assist in process setup.

### ***Specifications***

A typical lot analysis can be provided upon request. Commercial specifications are currently being developed.

### ***Delivery Containers***

Stainless steel containers of various sizes from 200 cc up to 200 liters. Containers are electropolished and finished to a high specification for supply and delivery of ultra-high purity chemicals. A variety of valve configurations, connection types and level sensing are available to suit most equipment needs.

### ***Delivery Equipment***

ChemGuard® 500 Automated Chemical Refill System – dual reservoir cabinet designed to continuously supply low-vapor pressure chemicals to the process tool.

### ***Strontium and Zirconium Precursors***

Air Products' advanced Titanium precursors may be combined with other High K materials, such as our Strontium or Zirconium precursors, to tailor the optimum dielectric film. Deposition trials have demonstrated their ability to deposit crystalline, stoichiometric films with high-dielectric constants.

### ***Metal Electrode Precursors***

Air Products offers precursors for deposition of conductive electrode materials such as Ru, TiN and TaN for use in MIM capacitors and HKMG transistors.

***For More Information***

If you would like additional information or technical assistance, write or call Air Products and Chemicals, Inc. at one of the following locations.

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