

## Yttrium and Lanthanide Precursors

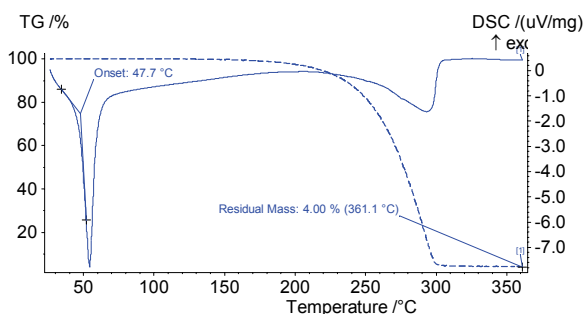
### Description

Oxides of Yttrium, Scandium and the Lanthanides are considered as High K dielectrics in their own right, as capping layers on other High K films, such as  $\text{HfO}_2$ , or as stabilizers of crystalline forms of High K dielectrics, such as  $\text{ZrO}_2$ . The Lanthanides comprise Lanthanum, Cerium, Praseodymium, Neodymium, Promethium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium and Lutetium.

19 K	20 Ca	21 Sc															22 Ti
37 Rb	38 Sr	39 Y															40 Zr
55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	72 Hf

They all share similar chemistry, forming oxides of the formula  $\text{M}_2\text{O}_3$  and being available as relatively volatile cyclopentadienyl and diketonate compounds of the formula  $\text{ML}_3$ . Examples of compounds from this series which can be used as ALD or CVD precursors include:

- $\text{La}(\text{thd})_3$  – white solid melting close to  $250^\circ\text{C}$ , sublimates at 0.2 torr and  $210^\circ\text{C}$ .
- $\text{Y}(\text{nBuCp})_3$  – pale yellow liquid, vapor pressure  $\sim 0.1$  torr at  $130^\circ\text{C}$
- $\text{Gd}(\text{iPrCp})_3$  – yellow solid melting close to  $50^\circ\text{C}$  (see TGA/DSC below)



*These are only examples. Contact us to discuss specific precursors of interest.*

### 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. Air Products solid source containers are recommended for high melting solids.

### Hafnium and Zirconium Precursors

Air Products' Yttrium and Lanthanide precursors may be combined with other High K materials, including our Hafnium and Zirconium precursors, to tailor the optimum dielectric film. Contact us for additional information on our Hafnium and Zirconium precursors.

### 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. Contact us for additional information on our metal electrode precursors.

***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.

Corporate Headquarters  
Air Products and Chemicals, Inc.  
7201 Hamilton Boulevard  
Allentown, PA 18195-1501  
Tel: (800) 654-4567 (US Only)  
Fax: (800) 272-4449  
[www.airproducts.com/electronics](http://www.airproducts.com/electronics)

Eastern USA  
Tel: (512) 899-7772  
Fax: (512) 892-4337

Western USA  
Tel: (408) 492-9080  
Fax: (408) 492-9140

Southwestern USA  
Tel: (602) 659-4300  
Fax: (602) 659-4385

Northwestern USA  
Tel: (503) 692.4633  
Fax: (603) 692.4352

Europe and Middle East  
Tel: +(44) 1932-249959  
Fax: +(44) 1932-258063

China  
Tel: +(86) (21) 6360-8080  
Fax: +(86) (21) 6360-9090

Japan (DAP)  
Tel: +(81) (6) 6120-0912  
Fax: +(81) (6) 6120-0919

Hong Kong  
Tel: +(852) 2527-1922  
Fax: +(852) 2527-1827

India  
Tel.: +(91) 22 2202-0345  
Fax: +(91) 22 2202-5588

Korea  
Tel: +(82) (2) 2170-8045  
Fax: +(82) (2) 733-0286

Malaysia  
Tel: +(603) 7727-1836  
Fax: +(603) 7726-1832

Singapore  
Tel: +(65) 6332-2440  
Fax: +(65) 6334-1005

Taiwan  
Tel: +(886) (2) 2521-5891  
Fax: +(886) (2) 2567-4704

Thailand  
Tel: +(66) (2) 676-6262  
Fax: +(66) (2) 676-6288

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