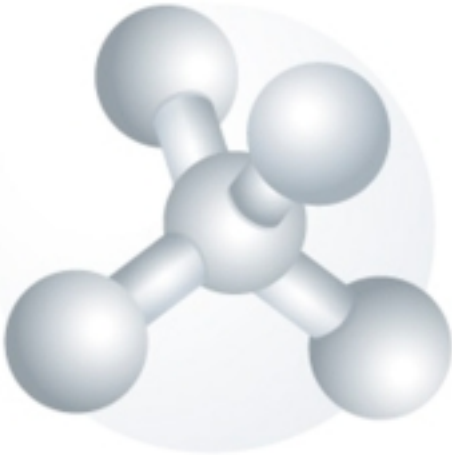


ALOHA™ (B)STO Precursors



Star-Ti

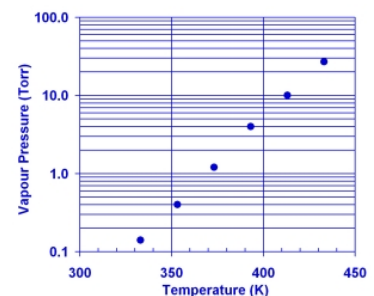
Air Liquide New Ti Precursor for High quality (B)STO films, ATO films, and conformal TiO₂ films

CAS n° Confidential

- Generic Ti precursors (e.g. Ti(OiPr)₄ or Ti(OMe)₄) are not fully satisfactory because of their narrow process window or delivery hurdle (solids).
- Air Liquide's R&D capability has developed Star-Ti, which can be used for ALD process for TiO₂ film, ATO film, and (B)STO film in combination with our Sr and Ba precursors.
- Star-Ti have excellent thermal stability (up to 400°C), which gives wider process window compared with the other Ti precursors.
- Star-Ti is yellow liquid that reacts slowly with air, and quickly with water.
- Like for most of the ALOHA advanced products, each canister of Star-Ti is supplied with a BALAZS CofA ensuring strict compliance with the specifications. Please consult www.balazs.com for more information.

Physical Chemical Properties

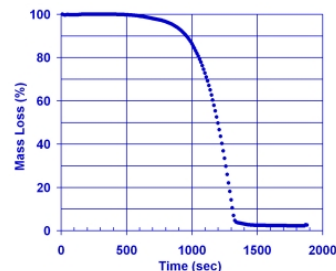
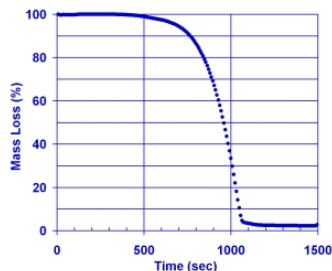
Physical Property	
Molecular Weight	Confidential
Physical State	Liquid
Colour	Yellow
Melting Point	<0°C
Boiling Point	285°C
Vapor Pressure	1 Torr @ 85°C
Density	1.068 g.cm ⁻³



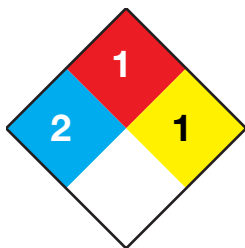
Star-Ti Properties - TGA

Left: Open cup TGA of Star-Ti

Right: Close cup TGA of Star-Ti



Hazard Rating



HMIS

Health: 2

Flammability: 1

Reactivity: 1

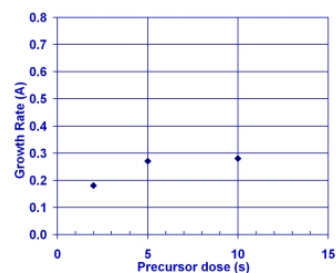
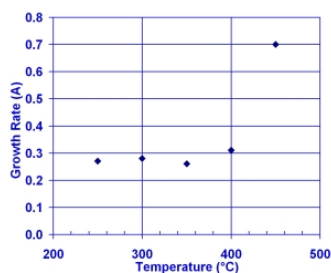
- Star-Ti is intrinsically stable under inert atmosphere. But it reacts moderately with air and oxidizing agents.
- Please consult ALOHA for additional handling data and detailed material compatibility recommendation.

Star-Ti TiO₂ ALD Performances

Left: Surface temperature effect

Right: Star-Ti precursor dose effect

- Star-Ti shows excellent thermal stability, which gives wider ALD process window. Its self limited ALD is up to 400°C.
- self limiting growth for >5s precursor dose, ALD growth ~0.3Å between 250 - 400°C



Packaging & Dispensing System

- Star-Ti can be packaged in a variety of canisters depending on the application.
- For on-board applications, Star-Ti is usually supplied in 1200 or 1800 ml canisters with various valving and dip-tube configurations.
- ALOHA's on-board canisters have all-metal construction and are cleaned and dried by state of art techniques.
- Star-Ti can be filled in properly documented customer-supplied canisters as well.
- Smaller R&D level packages are also available for basic research needs.



Transport Information

- Proper shipping name: Combustible Liquid, n.o.s.
- CAS n° confidential
- UN Number: 1993
- Packing Group: III



Air Liquide ALOHA is providing a complete advanced precursor solution. AL ALOHA portfolio covers low k, high k, barrier, metal gate, electrode, including some proprietary solutions for SiN, metals and high k. Certain aspects of Air Liquide technology may be covered by Air Liquide Intellectual Property rights.

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



ALOHA
ELECTRONICS PERFORMANCE MATERIALS