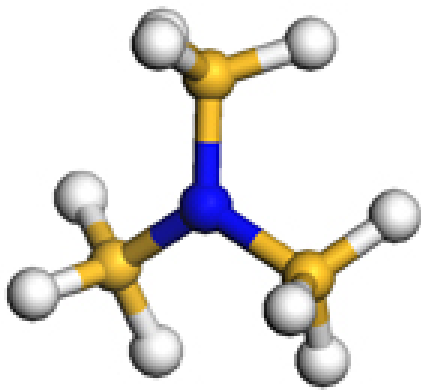


ALOHA™ CVD/ALD Materials



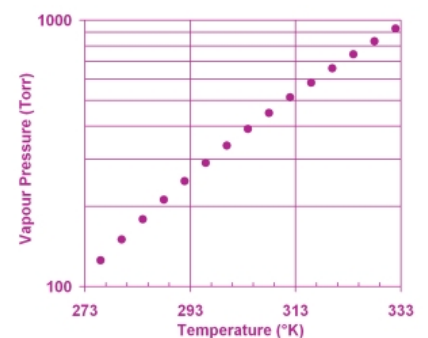
TSA

Trisilylamine
 $(\text{SiH}_3)_3\text{N}$, $\text{Si}_3\text{H}_9\text{N}$
 CAS n° 13862-16-3

- TSA is a new and highly volatile carbon and chlorine-free precursor for the deposition of Silicon Nitride by Low Pressure Chemical Vapour Deposition (LPCVD) in combination with NH_3 or other N sources. As opposed to other solutions, the very low thermal budget of the TSA-based process allows to extend its usage down to the 45 nm node.
- TSA-based nitride also bears distinctive features such as a straightforward tuneable film composition, a low H content, and perfect conformality in aggressive features.
- The absence of solid by-products such as NH_4Cl in the exhaust line and the possibility to deliver TSA it in the gas phase at subatmospheric pressure allow substantial facilitization and maintenance cost savings.
- In addition to the low-T SiN application, TSA can be used for a variety of processes as an Si and/or N source, such as the deposition of mixed oxide high-k films such as $\text{Hf}_x\text{Si}_y\text{O}_z$, or of metal alloys such as TaSiN or TiSiN.

Physical Chemical Properties

Physical Property	
Molecular Weight	107.4 g.mol ⁻¹
Physical State	Liquid
Melting Point	-106°C
Boiling Point	52°C
Vapor Pressure	315 Torr at 20°C
Auto Ignition Point	Possibly Pyrophoric
Conversion Factor / N ₂ (MFC)	0.21

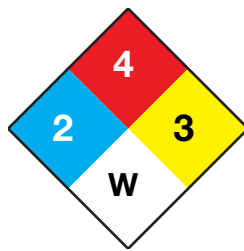


AL Specifications

Parameter	Unit	Specification
Assay	%	>99,5
Water Content	ppm	reacts
Total Chloride	ppm	<=10



Hazard Rating



HMIS

Health: 2
Flammability: 4
Reactivity: 3

As TSA is possibly pyrophoric, great care should be taken for the handling and facilitization of TSA. ALOHA team provides support and product stewardship to help our customers setup their TSA supply systems.

Handling

- TSA is a highly volatile stable liquid at room temperature and under inert atmosphere.
- TSA is possibly pyrophoric, although self-ignition tests have shown that gaseous TSA does not spontaneously ignite in oxygen-enriched air.
- Please contact Air Liquide at aloha@airliquide.com for MSDS and TSA facilitization guidelines.

Packaging & Dispensing System

- Thanks to its high vapour pressure, low heat of vaporization and extremely high efficiency (g/wafer), TSA can be delivered to process tools directly in the gas phase from a Gas Cabinet at subatmospheric pressure. For high flows (multiple chambers), the patented AVP Gas Cabinet is the solution of choice.
- The patented AVP concept allows to compensate exactly the heat of vaporization of the liquid TSA by a controlled heat input, without overheating the cylinder. An AVP cabinet can deliver in average 3 times the maximum flow of a standard gas cabinet.
- TSA is packaged in size 1, 3, 3-short and 7 DOT cylinders. Other packaging is available on demand.



Transport Information

- Proper shipping name: Flammable liquid, corrosive, NOS
- CAS n° 13862-16-3
- UN Number : UN 2924
- Class/division: 3
- Package group: I
- Label: Class 3 (Flammable), Class 8 (Corrosive)



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 the following patents or their foreign equivalents : WO 2004/030071.

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

