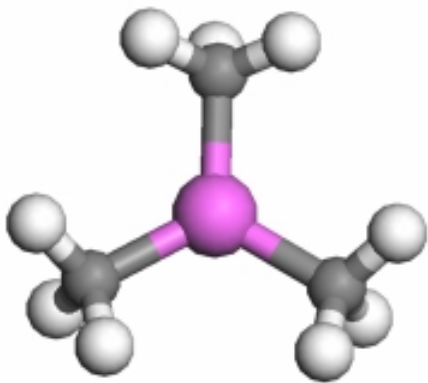


ALOHA™ CVD/ALD Materials



TMA

TrimethylAluminium (dimer)

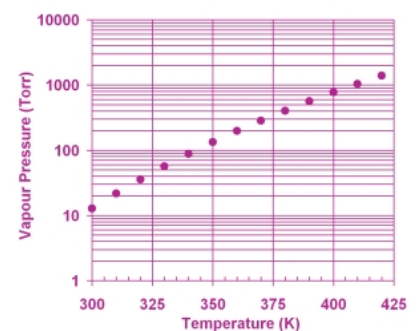
$\text{Al}[\text{CH}_3]_3$

CAS n°75-24-1

- **TMA is a clear liquid that burns spontaneously upon contact with air, and reacts explosively with water. TMA handling requires extreme care and to be performed only by qualified personnel wearing appropriate protective equipments. Please consult ALOHA for handling recommendations.**
- In the Si semiconductor industry, TMA is used essentially for the deposition of Al_2O_3 , either pure or as a mixed oxide of other elements such as Silicon, Hafnium or Zirconium. It can also be used in conjunction with NH_3 to deposit AlN films.
- Because of its extreme reactivity to oxygen sources, TMA is mostly used in ALD mode for high-k oxide deposition, rather than by MOCVD.
- Beside semiconductor application, high purity TMA is used for optoelectronics applications, and low grade TMA is a common Ziegler-Natta catalyst in the petrochemical industry.

Physical Chemical Properties

Physical Property	
Molecular Weight	72.1 g.mol ⁻¹
Physical State	Liquid
Colour	Colourless
Melting Point	15°C
Boiling Point	125-126°C
Vapour Pressure	9 Torr @ 20°C
Flash Point	-17°C
Specific Gravity	0.752 g.cm ⁻³
Viscosity	1.12 cP @ 20°C

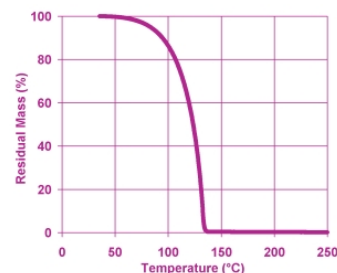
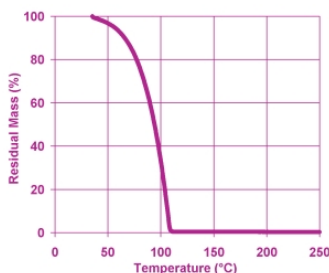


ALOHA TMA TG Analysis

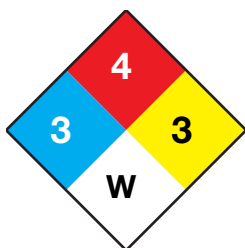
ALOHA TMA is specifically optimized for semiconductor applications with extremely tight specifications.

In TG analysis, it shows extremely clean evaporation.

- Left: Open cup TGA of TMA
- Right: Close cup TGA of TMA



Hazard Rating



HMIS

Health: 3
Flammability: 4
Reactivity: 3

No Water

The product should be handled solely by trained personnel having proper PPE with ultra-dry, state of the art equipments. With our experience on TMA handling and equipment, Air Liquide Electronics provides product stewardship to support TMA usage and facilitization worldwide.

Material Compatibility

- TMA is compatible with most materials used in semiconductor manufacturing equipments, such as stainless steel, PTFE and PCTFE. Polyimide and Viton should be avoided when in contact with liquid TMA.
- In any case, the materials in contact with TMA should be perfectly leak-checked and thoroughly dried with UHP inert gas.

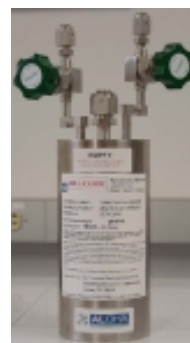
Packaging & Dispensing System

- For safety reasons, **TMA is always packaged in all-welded canisters having a clear fitting polarization.**
- For on-board bubbler or cross flow applications, TMA is usually supplied in 800 or 1300 ml ampules. For remote delivery, larger canisters of 3200 ml are frequently used. However, the canister size, dimensions and options such as liquid level sensing, pneumatic valves, etc., can be customized to meet your specific requirements.
- A special version of the CANDI™, ALOHA's remote dispense system, has been specially designed with enhanced safety measured to accommodate the specific hazards of TMA. This configuration is qualified by several key OEMs and is currently used at multiple customers worldwide.



Transport Information

- Proper Shipping name : Aluminum Alkyls, N.O.S.
- CAS n° 75-24-1
- UN Number: 3051
- Class/division: 4.2
- Package group: PG I
- Hazard Labels required : Class 4.2 (Spontaneously combustible), Class 4.3 (Dangerous When Wet)
- Transportation : Sea freight or Land only. AIR FREIGHT FORBIDDEN



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.

