Technical Data Sheet
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TMA-SP
Trimethylaluminum, solar purity grade

CAS Number	75-24-1
EINECS/EC	200-853-0
Molecular Formula	$Al(CH_3)_3$

APPLICATION

Trimethylaluminum, Solar Purity Grade, abbreviated as TMA-SP, with chemical formula, $Al(CH_3)_3$, is a preferred organometallic precursor. Solar cell producers use TMA-SP to form an aluminum oxide passivation layer by atomic layer deposition (ALD) or plasma-enhanced chemical vapor deposition (PECVD). With TMA-SP, these processes lead to enhanced efficiency in passivated emitter and rear contact (PERC) solar cells and in other configurations of solar panels.

TMA-SP is provided as a "neat" or undiluted liquid. TMA-SP is a clear, colorless, pyrophoric liquid which catches fire when exposed to air. TMA-SP is known to react violently with water, acids, other protic compounds, oxidizing agents, certain metals, and halogenated compounds. TMA-SP should be stored away from flammable materials in a cool, dry location under an inert atmosphere (e.g., dry nitrogen) where the storage temperature does not exceed 40°C.

SPECIFICATION

TMA-SP Purity	Value in wt.%
Metals Basis Content	>99.999
Overall Basis	>99.0

PHYSICAL PROPERTIES

TMA-SP Characteristic	Value with Units
Formula [$Al(CH_3)_3$] Weight	72.09 g/mol
Liquid Density	0.756g/mL at 15°C
Liquid Viscosity	1.12 cP at 20°C
Melting Point	15°C
Boiling Point	127°C at 1.0 atm
Vapor Pressure	30.3 mmHg at 40°C
Vapor Pressure	8.9 mmHg at 20°C

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HANDLING & STORAGE

TMA-SP presents potential hazards not common to most liquid chemicals. The pyrophoric nature of TMA-SP means it reacts spontaneously if exposed to air, releasing smoke, heat, and flammable vapors. TMA-SP is a clear, non-corrosive, mobile liquid with a low vapor pressure. The material of construction for all pipes, vessels, and protective equipment contacting TMA-SP should be stainless steel. Never use plastics. Fumes may cause skin and eye irritation. Avoid inhalation of fumes. If inhalation occurs, medical assistance should be immediately sought. Water, foam, or halogenated compounds are not recommended as a fire-fighting media. Instead, use dry powder, soda ash, or lime. As is the case with any exposure, prompt medical attention is required. Rescue personnel should be equipped with the appropriate and proper protective equipment to ensure they are not exposed. For toxicity information, please refer to the Safety Data Sheet. For more detailed information and procedures for handling metal organics, please refer to Albemarle's 'Handling Procedures for Organometallics' manual, which is available upon request. Albemarle's commitment to product stewardship involves direct customer engagement whereby highly trained and certified technical personnel perform on-site safety audits, handling demonstrations, and are available for classroom technical discussions.

TRANSPORT & PACKAGING

Proper Shipping Name: ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE, (Trimethylaluminum), METAL ALKYL

Hazard Class: 4.2 (spontaneously combustible), sub class 4.3 (dangerous when wet)

ID Number: UN3394

Packing Group: Group I

Placards: spontaneously combustible with #4, UN3394 ID number, dangerous when wet with #4

IATA/ICAO: Forbidden transport on passenger and cargo aircrafts

Laboratory Cylinders and Dual-Valve Cylinders

Albemarle supplies organometallics either undiluted (neat) or diluted with hydrocarbons (blended). Laboratory cylinders are available in 0.4-gallon and 1-gallon sizes. For slightly larger quantities, 5-, 26- and 119-gallon dual-valve cylinders are available. For 26-gallon cylinders and smaller, the container is sold with the product. The 119-gallon cylinders are returnable to Albemarle.

Advantages of Albemarle's 0.4-gallon and 1-gallon laboratory cylinders include:

1. The design of the "bumped-back" bottom allows these cylinders to stand by themselves.
2. An 1800 psi (125 kg/cm2) pressure rating provides maximum safety in the laboratory or stockroom, even during prolonged storage.
3. Safety relief devices (which could permit inadvertent release of a pyrophoric chemical) are unnecessary.
4. A side inlet on the closure permits use without a dry box. Laboratory cylinders can, of course, be readily used in a dry box.
5. The design of the closure and the dip tube (available from Albemarle) allow laboratory cylinders to be used as dual-valve containers.
6. The wide throat of the closure (1⁄2-inch [1.3 cm] diameter) permits easy use of syringes or similar devices.
7. Construction is all metal for durability.

The 0.4- and 1-gallon laboratory cylinders are shipped inside a carton. Both sizes have screw-on caps to protect the valve and can be shipped without further packaging. Laboratory cylinders should be handled in a dry box whenever possible because this is the safest and generally the most convenient way to unload these small containers. However, if a dry box is not available the cylinders can be unloaded with a dip-leg apparatus (available from Albemarle separately) using the procedure on the following page. (The procedure also can be used in a dry box.) If the container requires heating, use heated air rather than hot water or steam. Be sure all equipment is free of oxygen and moisture. Proper personal protective equipment must be worn. Be sure to read and understand all procedures (and emergency procedures). Familiarize yourself with handling and safety hazards prior to proceeding with any procedure.

Container Shell Volume Designation		Nominal Volume		Tare Weight		Max Design	Container Dimensions					
		U.S. Gallons	Liters	Pounds	Kg	Pressure (psig)	Inches			Centimeters		
							X	Y	Z	X	Y	Z
Laboratory Cylinder	0.4- gallon*	0.39	1.47	5.6	2.5	1800	2	10.0	4.2	5.1	25.4	10.6
	1- gallon*	0.94	3.6	13	5.9	1800	2	14.5	5.25	5.1	36.8	13.3
Dual-Valve Cylinder	5- gallon*	5.7	22	25	11	240	4.13	14.75	12.5	10.5	38	32
	26- gallon*	28	106	80	36	240	4.13	45.75	14.5	10.5	116	37
Portable Tank	500-gallon*	497	1880	2359	1070	200	"Handling Procedures for Organometallics" within Albemarle manual, table on page 26					

Notes: All values are approximate because of slight variations from one container to another.
** Nominal volume, U.S. gallons.*

OTHER INFORMATION

Further Related Documents

Safety Data Sheet

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