



TMAL SSG (TRIMETHYLALUMINUM)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product name TMAL SSG (TRIMETHYLALUMINUM)	Chemical description Trimethylaluminum
Synonym TMAL Select Semiconductor Grade	Chemical formula C ₃ H ₉ Al
CAS number 75-24-1	Chemical family Aluminum alkyl
Supplier Akzo Nobel Polymer Chemicals LLC 300 South Riverside Plaza Chicago, IL 60606 USA	
Medical/Handling Emergency + 1-914-693-6946 Dobbs Ferry, NY USA	Transportation Emergency CHEMTREC - USA: 1-800-424-9300 CANUTEC - CANADA: 1-613-996-6666
Product use Semiconductors	Product/technical Information 1-800-828-7929
Date of first issue 11-08-1994	Date of last issue / Revision # 06-20-2000 / 8.00

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	Percentage(s)	CAS number
Trimethylaluminum	100.00	75-24-1

3. HAZARDS IDENTIFICATION

<p>Emergency overview Clear, colorless liquid DANGER! EXTREMELY FLAMMABLE. CATCHES FIRE IF EXPOSED TO AIR. CAUSES SKIN AND EYE BURNS. REACTS VIOLENTLY WITH WATER. Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.</p>
<p>Health effects Skin and eye contact are the primary routes of exposure to this product. Inhalation of this metal alkyl is unlikely due to the highly reactive nature of the metal alkyl with air and its low vapor pressure. This material will react with moisture in or on the skin to produce thermal and chemical burns. This product will react with moisture in the eyes to produce severe chemical and thermal burns. Ingestion will result in burning of the mouth, throat and any part of the gastrointestinal system with which the material comes in contact. Nausea and vomiting may occur.</p>

Carcinogenicity	
Description	Applicable
IARC	no
NTP	no



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OSHA	no
ACGIH	no

4. FIRST AID MEASURES

Inhalation

Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

Skin

Very quickly and without touching the victim, wash victim down with large amounts of cold water from a hand-held hose, as if to flush away the chemical. CAUTION: Do not spray victim from the front. The flames will increase in intensity when water is first applied, but will quickly die out. Lay the victim flat on his back on a stretcher without removing the burnt clothing. Turn head to the side. Cover victim with a sterile sheet or a clean, dry cloth. Obtain medical attention immediately.

Eye

Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. DO NOT let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

Ingestion

Because of the reactive nature of this material, ingestion is unlikely, however, if swallowed DO NOT INDUCE VOMITING. Call a physician or a poison control center immediately. Give victim plenty of water to drink. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately

Note to physician

There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product.

Attending physician should treat exposed patients symptomatically. Chemical burns on the skin should be treated as thermal burns. Flush eyes with buffered or plain irrigating solutions. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient.

5. FIRE-FIGHTING MEASURES

Flash point PYROPHORIC! (ignites in air)	Autoignition temperature Ignites spontaneously in air.
Flash Method Not Applicable	Explosion limits lower: Not applicable upper: Not applicable
Extinguishing media THE MOST EFFECTIVE FIRE EXTINGUISHING AGENT IS DRY CHEMICAL POWDER PRESSURIZED WITH NITROGEN. Vermiculite or dry sand may also be used. CAUTION: REIGNITION MAY OCCUR. DO NOT USE FOAM, WATER (except as explained below), CARBON TETRACHLORIDE OR CHLOROBROMOMETHANE extinguishing agents as product either reacts violently or liberates toxic fumes and vapors on contact with these agents.	



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Fire fighting procedures

Protecting against fire by strict adherence to safe operating procedures and proper equipment are the best ways to minimize the possibility of fire damage. Immediate action should be taken to confine the fire. All lines and equipment which could contribute to the fire should be shut off.

Standard fireman's bunker gear is recommended for fighting metal alkyl fires. If the fire cannot be controlled with extinguishing agents, keep a safe distance, protect adjacent property and allow burn until consumed.

Human exposure must be prevented and nonessential personnel evacuated from the immediate area.

Breathing vapors from metal alkyl/hydrocarbon fires should be avoided by using proper respiratory equipment.

A NIOSH approved, positive-pressure/pressure demand, air-supplied, full-face respirator should be used.

Fire and explosion hazards

Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.

This material may react with air, water and compounds containing active hydrogen such as alcohols and acids. Reaction with water and air liberates flammable hydrocarbon gas and alcohol. Compounds containing oxygen or organic halide may react upon contact with the product.

Do not use welding or cutting torch on or near any container of this material, even empty, because an explosion could occur. Do not store near heat or open flame.

Hazardous products of combustion

Products of complete combustion are carbon dioxide, water and aluminum oxide. Additionally, products of incomplete combustion may include carbon monoxide, elemental carbon and hydrocarbons (alkanes and alkenes).

NFPA ratings

Hazard	Rating
Health	3
Flammability	4
Reactivity	3
Other	-W

6. ACCIDENTAL RELEASE MEASURES

Methods for cleaning up

Appropriate personal protective equipment (PPE) should be worn while working with spilled material. Block off source of spill. Spilled material will very likely give off smoke and fumes and may ignite spontaneously. After fire is extinguished or has been allowed to burn out, wash spill away with copious amounts of water (See Section 5, Fire Fighting Measures). CAUTION: Water may cause ignition/ reignition to occur. Dike water for later disposal. Do not allow contaminated water to enter waterways.

7. HANDLING AND STORAGE

Handling

Electrically grounded tanks and containers should always be used as should non-sparking, electrically grounded hand tools and appliances. Ground or bond to ground all vessels when transferring to prevent the accumulation of static electricity. See National Electric Code.

Storage

Store under an inert atmosphere. Dry nitrogen is a suitable inert gas. Containers should be stored in a cool, well-ventilated area away from flammable materials and sources of heat. Exercise due caution to prevent damage to or leakage from the container.

Maximum storage temperature

not determined



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General comments

Under inert conditions the product is not corrosive to metals commonly used in construction. Some plastics and elastomers may be attacked. Contact Akzo Nobel Polymer Chemicals LLC for specific recommendations regarding suitable materials for use with this product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection

This material is normally handled under nitrogen and closed process conditions. In an emergency where adequate ventilation is not available and conditions could generate mist or aerosol, inhalation must be prevented through the use of NIOSH-approved organic vapor/ acid gas respirators with dust, mist and fume filters to reduce potential for exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/ pressure-demand, air-supplied respirator.

When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

Skin protection

Skin contact must be prevented through the use of fire-retardant clothing. During sampling, disconnecting lines or opening connections, additional protective outerwear including full-face shield, impervious gloves, aluminized suit, a hard hat, steel toed safety shoes that cover the ankles and chemical safety goggles should also be worn.

Eye protection

Because eye contact with this product may cause severe and possibly permanent damage, chemical goggles and/or a full face shield must be worn whenever handling this product.

Ventilation protection

This material is normally handled under closed process conditions.

Other information

This product should not be used until all personnel handling it have been thoroughly trained. Contact Akzo Nobel Polymer Chemicals LLC, Chicago, IL. Additional information on safety and handling of organometallics is available in the Akzo Nobel Polymer Chemicals LLC brochure on metal alkyls.

During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed. Waste resulting from these procedures should be handled in an environmentally safe manner.

All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for exposure to this material.

Before eating, hands and face should be thoroughly washed.

Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freezeups in cold weather.

Applicable exposure limits

Other than any exposure limits which may be displayed below, there are no other exposure limits applicable for this product or its components. The exposure limits for the aluminum alkyl shown in Section 8 refers to the "Aluminum, Alkyls, not otherwise classified, as Al" value.

Agency	Value/Unit of measurement
Trimethylaluminum	
ACGIH TLV/TWA	2.000 mg/m ³
NIOSH REL/TWA	2.000 mg/m ³
PEL = Permissible Exposure Limit TLV = Threshold Limit Value TWA = Time Weighted Average STEL = Short Term Exposure Limit CEIL = Ceiling Exposure Limit REL = Recommended Exposure Limit WEEL = Workplace Environmental Exposure Limit IDLH = Immediate Dangerous to Life and Health	



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9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor Clear, colorless liquid	pH value not determined
Odor threshold (ppm) not determined	Relative vapor density (air=1) N/D
Volatile % N/D	Vapor pressure (mm Hg) 11 mm Hg @ 68 F (20 C)
Boiling point/range 261.00 °F 127.22 °C @ 760 mm Hg	Evaporation rate not determined
Melting point/range 59.00 °F 15.00 °C	
Cloud point N/D	Pour point not determined
Flash point PYROPHORIC! (ignites in air)	Solubility in water Reacts violently
Flash method Not Applicable	Solubility in other solvents Miscible with hydrocarbons
Autoignition temperature Ignites spontaneously in air.	
Specific Gravity/Density 0.74 @ 86 F (30 C)	Partition coefficient n-octanol/water not determined
Bulk density Not Applicable	
Other information Viscosity @ 86 F (30 C) = 0.9 cp. Density @ 77 F (25 C) = 0.748 g/ml.	Explosion limits lower: Not applicable upper: Not applicable

10. STABILITY AND REACTIVITY

Stability This product is stable when stored under dry, inert atmosphere and away from heat. Dry nitrogen containing less than 5 ppm oxygen and less than 5 ppm of moisture is recommended. This product is not sensitive to physical impact.
Incompatibilities This product may react violently with air, water, and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react vigorously upon contact with the product.
Polymerization Hazardous polymerization is not expected to occur.
Decomposition Product may undergo exothermic decomposition with gas (methane) evolution at temperatures above 120 C (248 F).
Conditions to avoid Avoid contact with incompatible material, excessive heat and flames.



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11. TOXICOLOGICAL INFORMATION

Oral LD50	Ingestion toxicity data are not available for this product.
Dermal LD50	Dermal toxicity data are not available for this product.
Inhalation LC50	Inhalation toxicity data are not available for this product.
Skin	Chronic dermal exposure effects for this product are not known. Skin contact with this product will cause severe chemical burns.
Eye	The acute eye effects of this product have not been determined.
Chronic toxicity/carcinogenicity	<p>Chronic ingestion effects of this product are not known. Ingestion will result in burns of the mouth, throat, esophagus and digestive tract.</p> <p>Chronic inhalation exposure effects for this product are not known.</p> <p>The carcinogenic/mutagenic properties of this product are not known.</p> <p>The reproductive toxicity of this product is not known.</p> <p>The neurotoxic effects of this product are not known.</p> <p>Overexposure to this product may affect the skin and eyes.</p>
Other toxicological information	No other toxic effects for this product are known.

12. ECOLOGICAL INFORMATION

Ecotoxicological information	The ecological toxicity of this product is not known.
Bioaccumulation	This product decomposes to hydrogen, hydrocarbons and elemental aluminum.
Other information	Other ecological information on this product is not known.

13. DISPOSAL CONSIDERATIONS

<p>Waste disposal in accordance with regulations</p> <p>Incineration by controlled feed of air and product is a suitable disposal procedure. Alternately, deactivation can be achieved by diluting the product with hydrocarbon (heptane, etc.) to less than 5 weight percent metal alkyl concentration and treating the hydrocarbon solution with water under a nitrogen atmosphere in a vented and agitated container. Always add the diluted metal alkyl solution to a large excess of water. Allow for the generation of heat and flammable hydrocarbons when treating with water. Conduct water treatment in the absence of oxygen gas to avoid possible ignition of flammable material. The products from hydrolysis are ethane and aluminum oxide(hydrated).</p> <p>Consult RCRA hazardous waste regulations prior to deactivation for potential treatment permitting considerations.</p> <p>Should the unused product become a waste material, it would meet the characteristics of an ignitable (D001) and reactive (D003) waste per 40 CFR, 261, Subpart C. It is the responsibility of the waste generator to evaluate whether his wastes are hazardous by characteristics or listing.</p> <p>Note: A technical bulletin (No. 95-90) is available from Akzo Nobel Polymer Chemicals LLC describing details of disposal of laboratory quantities of metal alkyls.</p>
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Container disposal

Containers with residual semiconductor grade metal alkyls may be returned to : Akzo Nobel Polymer Chemicals LLC, 730 Battleground Road, Deer Park, Texas 77536. Return shipments of containers are to be in compliance with DOT regulations.

14. TRANSPORT INFORMATION

Shipping description	ALUMINUM ALKYLs 4.2, UN3051, PG I NORTH AMERICAN EMERGENCY RESPONSE GUIDE NO. 135 ICAO: FORBIDDEN IMO: UN3051
Required labels	Primary Label: SPONTANEOUSLY COMBUSTIBLE Subsidiary Label: DANGEROUS WHEN WET
Environmentally hazardous substance	This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A.

15. REGULATORY INFORMATION

Products and/or components listed below are subject to the following:

Trimethylaluminum

Massachusetts Substance List	yes
New Jersey R-T-K Hazard. Sub.	yes
Penn. Hazardous Substance list	yes
Toxic Subst. Cont. Act -listed	yes
Domestic Substance List-Canada	yes

Hazard classes

Description	Applicable
HMIS Hazard Rating Source	HMIS
HMIS Health	3
HMIS Flammability	4
HMIS Reactivity	3
WHMIS Hazard Class	B-6, D-2B, E, F

Other regulatory information

No other regulatory information is available on this product.

16. OTHER INFORMATION

Other information

No other information is available.

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