

Material Safety Data Sheet (MSDS)

Trimethylaluminum

Date of Issue: September, 04, 2012

Revision: 1.0

1. Product and company identification

1.1 Product Name: Trimethylaluminum

1.2 Recommended use of the chemical and restrictions on use: Semiconductor Processing

1.3 Manufacturer/Supplier/Distributor Information:

- Name: DNF Co., Ltd.
- Address: 142, Daehwa-ro, 132beon-gil, Daedeok-ku, Daejeon, 306-802, Republic of Korea
- Telephone: +82-42-932-7939
- Fax: +82-42-932-7947
- Emergency phone number: +82-31-205-7939

2. Hazards identification

2.1. Hazard-Risk Classification

- Flammable Liquids: Category 2
- Pyrophoric Liquids: Category 1
- Skin Corrosion/Irritation: Category 1
- Serious eye damage/eye irritation: Category 1
- Specific Target Organ Toxicity - single exposure: Category 2

2.2 Label elements including precautionary statements

- **Symbol:**



- **Signal Word:** Danger

- **Hazard-Risk Statement**

H225 Highly flammable liquid and vapour

H250 Catches fire spontaneously if exposed to air

H314 Causes severe skin burns and eye damage

H318 Causes serious eye damage
H371 May cause damage to organs

- Precautionary Statement

- Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
P222 Do not allow contact with air.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ventilating/lighting/.../ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P264 Wash ... thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

- Response

P310 Immediately call a POISON CENTER or doctor/physician.
P321 (...) Specific treatment (see ... on this label).
P363 Wash contaminated clothing before reuse.
P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302+P334 IF ON SKIN: Immerse in cool water/wrap in wet bandages.
P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing.
Rinse skin with water/shower.
P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
P370+P378 In case of fire: Use ... for extinction.

- Storage

P405 Store locked up.
P422 Store contents under ...
P403+P235 Store in a well-ventilated place. Keep cool.

- Disposal

P501 Dispose of contents/container to ...

2.3 Other Hazard·Risk which are not included in the classification criteria (e.g. dust explosion hazard):

- NFPA Rating - Health Hazard: 3, Fire: 4, Reactivity Hazard: 3

3. Composition/Information on ingredients

3.1 Chemical Name: Trimethylaluminum

3.2 Other name: Trimethylalane

3.3 CAS number: 75-24-1

3.4 EN number: 200-853-0

3.5 Molecular Formula: Al(CH₃)₃

3.6 Content (%): >99.5%

4. First aid measures

4.1 Eye contact

Immediately flush the eyes with copious amounts of water for at least 10-15 minutes.

A victim may need assistance in keeping their eye lids open.

Get immediate medical attention.

4.2 Skin contact

Wash off immediately with plenty of water for at least 15 minutes.

Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.

4.3 Inhalation

Remove the victim to fresh air.

Closely monitor the victim for signs of respiratory problems, such as difficulty in breathing, coughing, wheezing, or pain.

In such cases seek immediate medical assistance.

4.4 Ingestion

Never give anything by mouth to an unconscious person.

Immediately give large quantities of water to drink.

Induce vomiting if person is conscious. Prevent aspiration of vomit.

Turn victim's head to the side.

4.5 Indication of immediate medical attention and notes for physician

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

5. Fire-Fighting measures

5.1 Suitable (and unsuitable) extinguishing media

Suitable: Carbon dioxide, dry chemical powder, dry sand, soda ash or limestone powder.

Unsuitable: Water, Alcohols-resistant foam, Hydrocarbon type

5.2 Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products):

- **Products of Combustion:** Carbon oxides, Aluminum oxide

5.3 Special protective equipment and precautions for fire-fighters

Wear self contained breathing apparatus for fire fighting if necessary.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment.

Avoid breathing vapors, mist or gas.

Ensure adequate ventilation.

Remove all sources of ignition.

Evacuate personnel to safe areas.

Beware of vapours accumulating to form explosive concentrations.

Vapours can accumulate in low areas.

6.2 Environmental precautions and protective procedures

Prevent further leakage or spillage if safe to do so.

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

Do not flush with water.

7. Handling and storage

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking.

Take measures to prevent the build up of electrostatic charge.

7.2 Conditions for safe storage (including any incompatibilities)

Store in cool place.

Keep container tightly closed in a dry and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Never allow product to get in contact with water during storage.

8. Exposure controls & personal protection

8.1 Control parameters (e.g. occupational exposure limit values, biological limit values)

- ACGIH: 2mg/m³

8.2 Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice.
Wash hands before breaks and at the end of workday.

8.3 Personal protective equipment

- Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

- Eye protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

- Hands protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. Protective gloves against thermal risks. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

- Body protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, the type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

9. Physical and chemical properties

9.1 Appearance

- **physical state:** Liquid

- **color:** Colorless

9.2 Odour: No data available

9.3 Odour threshold: No data available

9.4 pH: No data available

9.5 Melting point/freezing point: 15°C

9.6 Initial boiling point and boiling range: 125°C

9.7 Flashing point: -17°C

9.8 Evaporation rate: No data available

9.9 Flammability (solid, gas): Not applicable

9.10 Upper/lower flammability or explosive limits: No data available

9.11 Vapor pressure: 69.3torr at 20°C

9.12 Solubility in water: React Violently

9.13 Vapor density: 2.5

9.14 Relative density: 0.752 g/ml

9.15 Partition coefficient: n-octanol/water: No data available

9.16 Auto-ignition temperature: No data available

9.17 Decomposition temperature: No data available

9.18 Viscosity: No data available

9.19 Formula mass: 72.09 g/mol

10. Stability and reactivity

10.1 Chemical stability and possibility of hazardous reactions: Stable at room temperature in closed containers under normal storage and handling conditions.

10.2 Possibility of hazardous reactions: Reacts violently with water.

10.3 Conditions to avoid (e.g. static discharge, shock or vibration, etc) Incompatible

materials: Heat, flames and sparks. Extremes of temperature and direct sunlight. Exposure to moisture.

10.4 Incompatible materials: acids, Oxygen, Alcohols, Halogens, Oxidizing agents

10.5 Hazardous decomposition products: Carbon oxides, Aluminum oxide

11. Toxicological information

11.1 Information on the likely routes of exposure

- Inhalation: May be harmful if inhaled. Material is extremely destructive to the tissue of

the mucous membranes and upper respiratory tract.

- Ingestion : May be harmful if swallowed. Causes burns.
- Eye : Causes eye burns.
- Skin: May be harmful if absorbed through skin. Causes skin burns.

11.2 Health hazards information

- Acute toxic: No data available
- Skin corrosive/irritant: No data available
- Serious eye damage/eye irritation: No data available
- Respiratory sensitization: No data available
- Skin sensitization: No data available
- Carcinogenicity: No data available
- Germ Cell Mutagenicity : No data available
- Reproductive toxicity: No data available
- Specific target organ toxicity (single exposure): Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea
- Specific target organ toxicity (repeated exposure): No data available
- Aspiration hazard: No data available

12. Ecological information

12.1 Aquatic and terrestrial ecotoxicity:

- Fish: LC50 57.024 mg/l 96hr
- Crustacea: LC50 60.976 mg/l 48hr
- Algae: EC50 38.054 mg/l 96hr

12.2 Persistence and degradability:

- Persistence: log Kow 1.970
- degradability: No data available

12.3 Bioaccumulative potential:

- Bioaccumulative: BCF 6.57
- Biodegradable: No data available

12.4 Mobility in soil: No data available

12.5 Other adverse effects: No data available

13. Disposal considerations

13.1 Disposal method

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

14.1 UN number: 3394

14.2 UN proper shipping name: Organometallic substance, liquid, pyrophoric, water-reactive
(Trimethylaluminum)

14.3 Transport hazard class: 4.2

14.4 Packing group (if applicable): I

14.5 Marine pollution (yes/no): No data available

14.6 Special precaution which a user to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises:

- F-G / S-M

15. Regulatory information

15.1 Industrial Safety and Health Act:

Measurement of working environment substances (Measurement cycle: 6 months)

Special medical examination substances

Special Health Examination substances (Measurement cycle: 12 months)

Exposure limits set substances

15.2 Toxic Chemical Control Act: Title compound not listed.

15.3 Dangerous Material Safety Control Act: 3rd Group Spontaneously Combustible Materials and Water-Prohibitive Materials (alkyl aluminium)

15.4 Wastes Management Act: Title compound not listed.

15.5 Other requirements in domestic and other countries

- Hazard symbols:

F Highly Flammable

C Corrosive

Xi Irritant

- Risk phrases:

R10 Flammable.

R14/15 Reacts violently with water, liberating extremely flammable gases.

R36/37/38 Irritating to eyes, respiratory system and skin.

- Safety phrases:

S16 Keep away from sources of ignition -- No smoking.

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S43 In case of fire, use ... ('Never use water').

16. Other information

16.1 Information source and references

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

<http://www.kosha.or.kr>

The Chemical Database (<http://ull.chemistry.uakron.edu/erd>)

<http://ecb.jrc.ec.europa.eu/esis/>

16.2 Issuing date: September, 04, 2012

16.3 Revision number and date

- Revision number: 0

- Revision Date: September, 04, 2012

16.4 Others: No data available

Since the Company shall have no control of the use of the product described herein, the company assumes no liability for loss or damage incurred from the proper or improper use of such product.

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