To Our Customers:

The attached Safety Data Sheet (SDS) was prepared by the vendor of the product you purchased through one of our divisions. We used the manufacturer's electronic document directly or scanned a paper copy and generated a file for our automated SDS delivery system.

All statements, technical information, and recommendations contained therein are solely that of the manufacturer of the product. We at Zep Inc. did not verify the accuracy and completeness of the statements and do not warrantee or guarantee the information. We provide vendor SDSs to assist our customers in their compliance efforts. The attached document is in compliance with one of the respective country regulatory requirements noted below:

The OSHA Hazard Communication Standard (in the United States)
The Hazardous Products Regulations (in Canada)

We made every effort to deliver all of the information prepared by the manufacturer. We cannot anticipate all conditions under which this information will be used. If you have any questions about the statements on the SDS, please contact the company shown on the document.

Zep Inc. assumes no liability or responsibility for loss or damage resulting from the improper use or handling of this product, from incompatible product combinations, or from the failure to follow instructions, warnings, and advisories in the manufacturer's product label and Safety Data Sheet.

Sincerely,

Product Stewardship Team
Zep Inc.

# [Material Safety Data Sheet]

## SECTION 1: Identification

### 1.1 Identification

Product ID : TGF-NT300UL-A

### 1.2 Recommended use and restrictions on use

Relevant identified used : Thermal Interface Material

Uses advised against : None Known

### 1.3 Supplier


Manufacturer/Supplier : NanoTIM Co., Ltd.

Address : 14, Gukjegwahak 2-ro, Yuseong-gu, Daejeon, Republic of Korea

Telephone : +82 42 719 3088

Fax : +82 42 719 3089

Website : nanotim.co.kr

Email : info@nanotim.co.kr


## SECTION 2: Hazard(s) Identification

Emergency overview

Not classififed. Read entire safety data sheet.

| Hazard class | Hazard category |
|---|---|
| None | None |

Pictogram(s)

None

Precautionary Statements

| | |
|---|---|
| Prevention | Not prescribed |
| Response | Not prescribed |
| Storage | Not prescribed |
| Disposal | Not prescribed |

Classification complies with OSHA Hazard Communication Standard (29 CFR 1910.1200) and is consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

See Section 11 for additional toxicological information.

## SECTION 3: Composition/Information on Ingredients

| Material Name | CAS No. | Wt. % |
|---|---|---|
| Aluminum oxide | 1344-28-1 | 5 ~ 20 % |
| Aluminum Hydroxide | 21645-51-2 | 70 ~ 90 % |

## SECTION 4: First-Aid Measures

| | |
|---|---|
| Eye contact | Rinse immediately and thoroughly with water including under the eyelids for at least 15 minutes.<br>Get medical attention. |
| Skin contact | Rinse the contacted skin area thoroughly with plenty of water as soon as possible(if available with soap).<br>Remove contaminated clothing and footwear. Get medical attention. Wash clothing before reuse. |
| Inhalation | Expose to fresh air. If no breathing, give artificial respiration. If breathing is difficult, give oxygen.<br>Get medical attention. |
| Ingestion | Do not induce vomiting. Never give anything by mouth under the condition of unconsciousness.<br>Get medical attention. |
| Symptoms | See Section 11. |

## SECTION 5: Fire-Fighting Measures

| | |
|---|---|
| Extinguishing media | Water spray, water fog, extinguishing foam, dry chemical or carbon dioxide. |
| Specific firefighting procedures | Wear self-contained breathing gears and full protective clothing, such as turn-out gear.<br>In case of fire, keep containers cool by spraying water. |
| Unusual fire or explosion hazards: | Closed containers may rupture due to build up internal pressure upon exposing to extreme heat. |
| Hazardous combustion products | Oxides of carbon. Oxides of Metals in Section 3. Toxic and irritating vapors. |

## SECTION 6: Accidental Release Measures

Use personal protection recommended in Section 8, isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental precautions : Do not allow product to enter sewer or waterways.

| | |
|---|---|
| Clean-up methods | Remove all sources of ignition. Ensure adequate ventilation. Perform in isolated area.<br>Keep unnecessary personnel away.<br>Soak up with inert absorbent material(e.g. sand, silica gel, acid binder, universal binder, sawdust).<br>Store in a closed container until ready for disposal.<br>Refer to Section 8 "Exposure Controls / Personal Protection" prior to clean up. |

## SECTION 7: Handling and Storage

| | |
|---|---|
| Handling | Use only with adequate ventilation. Prevent contact with eyes, skin and clothing.<br>Do not breathe vapor and mist. Wash thoroughly after handling. Refer to Section 8 |
| Storage | Keep in a cool, well ventilated area away from heat, sparks and open flame.<br>Keep container tightly closed until ready for use |

For information on product shelf life, please review labels on container or check the Technical Data Sheet

## SECTION 8: Exposure Controls/Personal Protection

Employers should complete an assessment of all work places to determine the need for, and selection of, proper exposure controls and protective equipment for each task performed.

- ACGIH TLV

| | |
|---|---|
| Aluminum oxide | TWA 1 ㎎/㎥ |
| Aluminum Hydroxide | TLV/TWA 8-hours 1 ㎎/㎥ (respirable fraction) |

- OSHA PEL

| | |
|---|---|
| Aluminum oxide | 5 ㎎/㎥ PEL Respirable fraction.<br>15 ㎎/㎥ PEL Total dust.<br>5 ㎎/㎥ TWA Respirable fraction.<br>15 ㎎/㎥ TWA Total dust.<br>15 MPPCF TWA Respirable fraction<br>50 MPPCF TWA Total dust. |
| Aluminum Hydroxide | 15 ㎎/㎥ TWA Total dust<br>5 ㎎/㎥ Respirable dust |

- AIHA WEEL

| | |
|---|---|
| Aluminum oxide | None |
| Aluminum Hydroxide | None |

- OTHER

| | |
|---|---|
| Aluminum oxide | None |
| Aluminum Hydroxide | None |

| | |
|---|---|
| Engineering controls | Provide adequate local exhaust ventilation to maintain worker exposure below exposure limits. |
| Respiratory protection | Use a NIOSH approved air-purifying respirator if the potential to exceed established exposure limits exists. |
| Eye/face protection | Safety goggles or safety glasses with side shields.<br>Safety showers and eye wash stations should be available.<br>No special protection is required for automatic dispensing process. |
| Skin protection | Use chemical resistant, impermeable clothing including gloves and either an apron or body suit to prevent skin contact. |

## SECTION 9: Physical and Chemical Properties

### 9.1 Product Properties

| | |
|---|---|
| A. Appearance | |
| Appearance | Paste at 20℃ |
| Color | Gray |
| B. Odor | Slight |
| C. Odor threshold | Not available |
| D. pH | Not available |
| E. Melting point/Freezing point | Not available |
| F. Initial boiling point and boiling point range | Not available |
| G. Flash point | Not Ignition Below 300 ℃. |
| H. Evaporating rate | Not available |
| I. Flammability(Solid) | V-0 (UL 94, Vertical Burning Test) |
| J. Upper/lower limit of inflammation and explosion range | Not available |
| K. Vapor pressure | Not available |
| L. Solubility | Not available |
| M. Vapor density | Not available |
| N. Specific gravity | 1.85 |
| O. n-octanol/water partition coefficient (Kow)) | Not available |
| P. Spontaneous ignition point | Not available |

| | |
|---|---|
| Q. Decomposition temperature | Not available |
| R. Viscosity | 150,000 cP |
| S. Molecular weight | Not available |

## SECTION 10: Stability and Reactivity

| | |
|---|---|
| Stability | Stable under normal conditions of storage and use. |
| Hazardous reactions | None under normal processing. |
| Hazardous decomposition products | Oxides of carbon. Oxides of Metals in Section 3. Irritating organic vapours. |
| Incompatible materials | Strong oxidizing agents. Strong acids. Strong alkalis. |
| Reactivity | Not available. |
| Conditions to avoid | High temperatures. Store away from incompatible materials.<br>Heat, flames, sparks and other sources of ignition. |

## SECTION 11: Toxicological Information

| | |
|---|---|
| Relevant routes of exposure | Skin, Inhalation, Eyes |
| Potential Health Effects/Symptoms | |
| - Inhalation | May cause respiratory tract irritation. |
| - Skin contact: | May cause skin irritation. |
| - Eye contact: | May cause irritation. |
| - Ingestion | May cause gastrointestinal tract irritation if swallowed. |
| Hazardous Component(s) | LD50s and LC50s |
| - Aluminium oxide | None |
| - Aluminum Hydroxide | None |
| Immediate and Delayed Health Effects | |
| - Aluminium oxide | Irritant, Nuisance dust, Corrosive |
| - Aluminum Hydroxide | None |

## SECTION 12: Ecological Information (non-mandatory)

| | |
|---|---|
| Ecological information | Not available. |

## SECTION 13: Disposal Considerations (non-mandatory)

Information provided is for unused product only.

| | |
|---|---|
| Recommended method of disposal | Follow all local, state, federal and provincial regulations for disposal. |
| Hazardous waste number | Not a RCRA hazardous waste. |

## SECTION 14: Transport Information (non-mandatory)

The transport information provided in this section only applies to the material/formulation itself, and is not specific to any package/configuration

A. U.S. Department of Transportation Ground (49 CFR)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

B. International Air Transportation (ICAO/IATA)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

C. Water Transportation (IMO/IMDG)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

## SECTION 15: Regulatory Information (non-mandatory)

United States Regulatory Information

| | |
|---|---|
| TSCA 8 (b) Inventory Status | All components are listed or are exempt from listing on the Toxic Substances Control Act Inventory. |
| TSCA 12 (b) Export Notification | None above reporting de minimis |
| CERCLA/SARA Section 302 EHS: | None above reporting de minimis. |

| | |
|---|---|
| CERCLA/SARA Section 311/312: | Immediate Health, Delayed Health |
| CERCLA/SARA Section 313: | This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). Aluminium oxide(CAS# 1344-28-1). |
| California Proposition 65 | No California Proposition 65 listed chemicals are known to be present.<br>Working environment measurement target material (Measurement cycle : 6 months) |
| Canada Regulatory Information | |
| CEPA DSL/NDSL Status | All components are listed on or are exempt from listing on the Canadian Domestic |

## SECTION 16: Other Information

This safety data sheet contains changes from the previous version in sections: First issue.

A. Date of initial preparation 2022-05-09

B. Revision number and Final revision date

Revision number 3 number

Final revision date 2023-10-13

C. Etc.

○ The prepared material safety data sheet (MSDS) is the data that has been edited and partially modified by referring to the MSDS.

# [Material Safety Data Sheet]

## SECTION 1: Identification

### 1.1 Identification

Product ID : TGF-NT300UL-B

### 1.2 Recommended use and restrictions on use

Relevant identified used : Thermal Interface Material

Uses advised against : None Known

### 1.3 Supplier


Manufacturer/Supplier : NanoTIM Co., Ltd.

Address : 14, Gukjegwahak 2-ro, Yuseong-gu, Daejeon, Republic of Korea

Telephone : +82 42 719 3088

Fax : +82 42 719 3089

Website : nanotim.co.kr

Email : info@nanotim.co.kr


## SECTION 2: Hazard(s) Identification

Emergency overview

Not classififed. Read entire safety data sheet.

| Hazard class | Hazard category |
|---|---|
| None | None |

Pictogram(s)

None

Precautionary Statements

| | |
|---|---|
| Prevention | Not prescribed |
| Response | Not prescribed |
| Storage | Not prescribed |
| Disposal | Not prescribed |

Classification complies with OSHA Hazard Communication Standard (29 CFR 1910.1200) and is consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

See Section 11 for additional toxicological information.

## SECTION 3: Composition/Information on Ingredients

| Material Name | CAS No. | Wt. % |
|---|---|---|
| Aluminum oxide | 1344-28-1 | 5 ~ 20 % |
| Aluminum Hydroxide | 21645-51-2 | 70 ~ 90 % |

## SECTION 4: First-Aid Measures

| | |
|---|---|
| Eye contact | Rinse immediately and thoroughly with water including under the eyelids for at least 15 minutes.<br>Get medical attention. |
| Skin contact | Rinse the contacted skin area thoroughly with plenty of water as soon as possible(if available with soap).<br>Remove contaminated clothing and footwear. Get medical attention. Wash clothing before reuse. |
| Inhalation | Expose to fresh air. If no breathing, give artificial respiration. If breathing is difficult, give oxygen.<br>Get medical attention. |
| Ingestion | Do not induce vomiting. Never give anything by mouth under the condition of unconsciousness.<br>Get medical attention. |
| Symptoms | See Section 11. |

## SECTION 5: Fire-Fighting Measures

| | |
|---|---|
| Extinguishing media | Water spray, water fog, extinguishing foam, dry chemical or carbon dioxide. |
| Specific firefighting procedures | Wear self-contained breathing gears and full protective clothing, such as turn-out gear.<br>In case of fire, keep containers cool by spraying water. |
| Unusual fire or explosion hazards: | Closed containers may rupture due to build up internal pressure upon exposing to extreme heat. |
| Hazardous combustion products | Oxides of carbon. Oxides of Metals in Section 3. Toxic and irritating vapors. |

## SECTION 6: Accidental Release Measures

Use personal protection recommended in Section 8, isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental precautions : Do not allow product to enter sewer or waterways.

| | |
|---|---|
| Clean-up methods | Remove all sources of ignition. Ensure adequate ventilation. Perform in isolated area.<br>Keep unnecessary personnel away.<br>Soak up with inert absorbent material(e.g. sand, silica gel, acid binder, universal binder, sawdust).<br>Store in a closed container until ready for disposal.<br>Refer to Section 8 "Exposure Controls / Personal Protection" prior to clean up. |

## SECTION 7: Handling and Storage

| | |
|---|---|
| Handling | Use only with adequate ventilation. Prevent contact with eyes, skin and clothing.<br>Do not breathe vapor and mist. Wash thoroughly after handling. Refer to Section 8 |
| Storage | Keep in a cool, well ventilated area away from heat, sparks and open flame.<br>Keep container tightly closed until ready for use |

For information on product shelf life, please review labels on container or check the Technical Data Sheet

## SECTION 8: Exposure Controls/Personal Protection

Employers should complete an assessment of all work places to determine the need for, and selection of, proper exposure controls and protective equipment for each task performed.

- ACGIH TLV

| | |
|---|---|
| Aluminum oxide | TWA 1 ㎎/㎥ |
| Aluminum Hydroxide | TLV/TWA 8-hours 1 ㎎/㎥ (respirable fraction) |

- OSHA PEL

| | |
|---|---|
| Aluminum oxide | 5 ㎎/㎥ PEL Respirable fraction.<br>15 ㎎/㎥ PEL Total dust.<br>5 ㎎/㎥ TWA Respirable fraction.<br>15 ㎎/㎥ TWA Total dust.<br>15 MPPCF TWA Respirable fraction<br>50 MPPCF TWA Total dust. |
| Aluminum Hydroxide | 15 ㎎/㎥ TWA Total dust<br>5 ㎎/㎥ Respirable dust |

- AIHA WEEL

| | |
|---|---|
| Aluminum oxide | None |
| Aluminum Hydroxide | None |

- OTHER

| | |
|---|---|
| Aluminum oxide | None |
| Aluminum Hydroxide | None |

| | |
|---|---|
| Engineering controls | Provide adequate local exhaust ventilation to maintain worker exposure below exposure limits. |
| Respiratory protection | Use a NIOSH approved air-purifying respirator if the potential to exceed established exposure limits exists. |
| Eye/face protection | Safety goggles or safety glasses with side shields.<br>Safety showers and eye wash stations should be available.<br>No special protection is required for automatic dispensing process. |
| Skin protection | Use chemical resistant, impermeable clothing including gloves and either an apron or body suit to prevent skin contact. |

## SECTION 9: Physical and Chemical Properties

### 9.1 Product Properties

| | |
|---|---|
| A. Appearance | |
| Appearance | Paste at 20℃ |
| Color | White |
| B. Odor | Slight |
| C. Odor threshold | Not available |
| D. pH | Not available |
| E. Melting point/Freezing point | Not available |
| F. Initial boiling point and boiling point range | Not available |
| G. Flash point | Not Ignition Below 300 ℃. |
| H. Evaporating rate | Not available |
| I. Flammability(Solid) | V-0 (UL 94, Vertical Burning Test) |
| J. Upper/lower limit of inflammation and explosion range | Not available |
| K. Vapor pressure | Not available |
| L. Solubility | Not available |
| M. Vapor density | Not available |
| N. Specific gravity | 1.85 |
| O. n-octanol/water partition coefficient (Kow)) | Not available |
| P. Spontaneous ignition point | Not available |

| | |
|---|---|
| Q. Decomposition temperature | Not available |
| R. Viscosity | 150,000 cP |
| S. Molecular weight | Not available |

## SECTION 10: Stability and Reactivity

| | |
|---|---|
| Stability | Stable under normal conditions of storage and use. |
| Hazardous reactions | None under normal processing. |
| Hazardous decomposition products | Oxides of carbon. Oxides of Metals in Section 3. Irritating organic vapours. |
| Incompatible materials | Strong oxidizing agents. Strong acids. Strong alkalis. |
| Reactivity | Not available. |
| Conditions to avoid | High temperatures. Store away from incompatible materials.<br>Heat, flames, sparks and other sources of ignition. |

## SECTION 11: Toxicological Information

| | |
|---|---|
| Relevant routes of exposure | Skin, Inhalation, Eyes |
| Potential Health Effects/Symptoms | |
| - Inhalation | May cause respiratory tract irritation. |
| - Skin contact: | May cause skin irritation. |
| - Eye contact: | May cause irritation. |
| - Ingestion | May cause gastrointestinal tract irritation if swallowed. |
| Hazardous Component(s) | LD50s and LC50s |
| - Aluminium oxide | None |
| - Aluminum Hydroxide | None |
| Immediate and Delayed Health Effects | |
| - Aluminium oxide | Irritant, Nuisance dust, Corrosive |
| - Aluminum Hydroxide | None |

## SECTION 12: Ecological Information (non-mandatory)

| | |
|---|---|
| Ecological information | Not available. |

## SECTION 13: Disposal Considerations (non-mandatory)

Information provided is for unused product only.

| | |
|---|---|
| Recommended method of disposal | Follow all local, state, federal and provincial regulations for disposal. |
| Hazardous waste number | Not a RCRA hazardous waste. |

## SECTION 14: Transport Information (non-mandatory)

The transport information provided in this section only applies to the material/formulation itself, and is not specific to any package/configuration

A. U.S. Department of Transportation Ground (49 CFR)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

B. International Air Transportation (ICAO/IATA)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

C. Water Transportation (IMO/IMDG)

| | |
|---|---|
| - Proper shipping name | Not regulated |
| - Hazard class or division | None |
| - Identification number | None |
| - Packing group | None |

## SECTION 15: Regulatory Information (non-mandatory)

United States Regulatory Information

| | |
|---|---|
| TSCA 8 (b) Inventory Status | All components are listed or are exempt from listing on the Toxic Substances Control Act Inventory. |
| TSCA 12 (b) Export Notification | None above reporting de minimis |
| CERCLA/SARA Section 302 EHS: | None above reporting de minimis. |

| | |
|---|---|
| CERCLA/SARA Section 311/312: | Immediate Health, Delayed Health |
| CERCLA/SARA Section 313: | This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). Aluminium oxide(CAS# 1344-28-1). |
| California Proposition 65 | No California Proposition 65 listed chemicals are known to be present.<br>Working environment measurement target material (Measurement cycle : 6 months) |
| Canada Regulatory Information | |
| CEPA DSL/NDSL Status | All components are listed on or are exempt from listing on the Canadian Domestic |

## SECTION 16: Other Information

This safety data sheet contains changes from the previous version in sections: First issue.

A. Date of initial preparation 2022-05-09

B. Revision number and Final revision date

Revision number 3 number

Final revision date 2023-10-13

C. Etc.

○ The prepared material safety data sheet (MSDS) is the data that has been edited and partially modified by referring to the MSDS.