1 Identification

Product identifier

Product name: Aluminum oxide, 20% in H₂O, colloidal dispersion

Stock number: 12733

Relevant identified uses of the substance or mixture and uses advised against:

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier: Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660

Fax: 800-322-4757

Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The product is not classified according to the Globally Harmonized System (GHS).

Hazards not otherwise classified: No information known.

Label elements

GHS label elements: Not applicable

Signal word: Not applicable

Hazard pictograms: Not applicable

WHMIS classification: Not controlled

Classification system

HMIS ratings (scale 0-4) (Hazardous Materials Identification System)

HEALTH 1

FIRE 0

REACTIVITY 0

Health (acute effects) = 1

Flammability = 0

Physical Hazard = 0

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Mixtures

Dangerous components: Not applicable

Additional information: None known.

Non-Hazardous Ingredients

| 24623-77-8 | Aluminum hydroxide oxide | 20.0% |
| 7697-37-2 | Nitric acid | 0.5% |
| 7732-18-5 | Water | 79.5% |

4 First-aid measures

Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact

Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing

Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed

No further relevant information available.

Indication of any immediate medical attention and special treatment needed

No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents: Product is not flammable. Use fire-fighting measures that suit the surrounding fire.

Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Nitrogen oxides (NOx)

Metal oxide fume

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation.

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up:

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.

Information about protection against explosions and fires: The product is not flammable

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility:
Water reacts with many metals to give hydrogen, often violently. Water is also incompatible with many reactive organic and inorganic chemicals.

Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems: Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

<table>
<thead>
<tr>
<th>PEL (USA)</th>
<th>REL (USA)</th>
<th>TLV (USA)</th>
<th>EL (Canada)</th>
<th>EV (Canada)</th>
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<tbody>
<tr>
<td>Nitric acid</td>
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<td>Long-term value: 5 mg/m³, 2 ppm</td>
<td>Long-term value: 10 mg/m³, 4 ppm</td>
<td>Long-term value: 10 mg/m³, 4 ppm</td>
<td>Long-term value: 5.2 mg/m³, 2 ppm</td>
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</tr>
</tbody>
</table>

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General information
Appearance:
Form: Dispersion
Color: White
Odor: Odorless
Odor threshold: Not determined.

pH-value: 4

Change in condition
Melting point/Melting range: Not determined
Boiling point/Boiling range: Not determined
Sublimation temperature / start: Not determined
Flammability (solid, gaseous): Not determined.
Ignition temperature: Not determined
Decomposition temperature: Not determined
Auto igniting: Product is not selfigniting.

Danger of explosion: Not determined.

Explosion limits:
Lower: Not determined
Upper: Not determined

Vapor pressure at 20 °C (68 °F): 23 hPa (17 mm Hg)
Density: Not determined
Relative density: Not determined.
Vapor density: Not determined.
Evaporation rate: Not determined.
Solubility in / Miscibility with
Water: Fully miscible
Partition coefficient (n-octanol/water): Not determined.
Viscosity:
Dynamic: Not determined.

(Contd. on page 3)
Safety Data Sheet
per OSHA HazCom 2012

Product name: Aluminum oxide, 20% in H₂O, colloidal dispersion

(Contd. of page 2)

10 Stability and reactivity

Reactivity: No information known.
Chemical stability: Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions:
- Water reacts violently with alkali metals.
- Water reacts with many metals to give hydrogen, often violently. Water is also incompatible with many reactive organic and inorganic chemicals.

Conditions to avoid: No further relevant information available.

Incompatible materials: No information known.

Hazardous decomposition products:
- Nitrogen oxides
- Metal oxide fume

11 Toxicological information

Information on toxicological effects

Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for components in this product.

LD/LC50 values that are relevant for classification:
- 7697-37-2 Nitric acid
  - Inhalative LC50/4H: 0.13 mg/l/4H (rat)

Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.

Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for components in this product.

Specific target organ system toxicity - repeated exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: No effects known.

Additional toxicological information:
- To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
- The product is not subject to classification according to internally approved calculation methods for preparations.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability: No further relevant information available.
Bioaccumulative potential: No further relevant information available.
Mobility in soil: No further relevant information available.

Additional ecological information:
- General notes: Do not allow material to be released to the environment without proper governmental permits.
- Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
- Avoid transfer into the environment.

Results of PBT and vPvB assessment
- PBT: Not applicable.
- vPvB: Not applicable.
- Other adverse effects: No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation: Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.
Recommended cleansing agent: Water, if necessary with cleansing agents.

14 Transport information

UN-Number
DOT, ADN, IMDG, IATA: Not applicable

UN proper shipping name
DOT, ADN, IMDG, IATA: Not applicable

Transport hazard class(es)
DOT, ADR, ADN, IMDG, IATA
Class: Not applicable

Packing group
DOT, IMDG, IATA: Not applicable

Environmental hazards:
Marine pollutant (IMDG): No

Special precautions for user
Not applicable.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

Transport/Additional information:
DOT Marine Pollutant (DOT): No

(Contd. on page 4)
Product name: Aluminum oxide, 20% in H₂O, colloidal dispersion

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

- GHS label elements Not applicable
- Hazard pictograms Not applicable
- Signal word Not applicable
- Hazard statements Not applicable

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

| 7697-37-2 Nitric acid | 0.5% |

California Proposition 65

Prop 65 - Chemicals known to cause cancer
None of the ingredients are listed.

Prop 65 - Developmental toxicity
None of the ingredients are listed.

Prop 65 - Developmental toxicity, female
None of the ingredients are listed.

Prop 65 - Developmental toxicity, male
None of the ingredients are listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.

None of the ingredients are listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

None of the ingredients is listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use)

None of the ingredients is listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/24/2015 / -

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
DOT: US Department of Transportation
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)