Please note that the Washington State Department of Ecology’s Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.
### SOP Revision History

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Rev number</th>
<th>Summary of changes</th>
<th>Sections</th>
<th>Reviser(s)</th>
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SOPs\ECY_EAP_SOP_EquipmentDeconToxicsSampling_v1_0EAP090.docx_03/26/14_Page 3
Environmental Assessment Program


1.0 Purpose and Scope

1.1 This document is the Environmental Assessment Program (EAP) Toxics Study Unit (TSU) Standard Operating Procedure (SOP) for decontaminating reusable field equipment to be used for sampling toxic chemicals in various environmental media.

1.2 Washington Department of Ecology (Ecology) investigates toxic contaminants in water, sediment, plant and animal tissues. To obtain accurate, representative samples, sampling equipment must be free from residual contamination. Quality assurance measures are described to be implemented after cleaning to ensure equipment is sufficiently decontaminated.

2.0 Applicability

2.1 This document was prepared for use by EAP, but it may have a broader scope of application within Ecology and the regulatory community. This procedure is to be followed by EAP personnel conducting scientific studies to determine the occurrence and concentration of toxic chemicals in the environment. This SOP does not eliminate the need to have project specific protocols to meet specialized objectives or to have an approved Quality Assurance Project Plan (QAPP) on file before sampling begins.

2.2 The cleaning procedures explained in this SOP are intended for use in a clean laboratory setting. These procedures can be adapted for use in the field. Field cleaning procedures are not included in this document.

3.0 Definitions

3.1 ACS - American Chemical Society

3.2 Blank - A sample of clean matrix submitted to the lab used to assess potential sources of contamination.

3.3 Deionized water - Water that has had the ions removed, usually by an ion exchange process.
3.4 HPLC – High Performance Liquid Chromatography: A analytical method for separating compounds that are dissolved in solution.

3.5 K_{ow} – Octanol-water partition coefficient: The ratio of an organic compounds concentration in a known volume of n-octanol to it’s concentration in a known volume of water at a specified temperature.

3.6 Matrix – All other parts of a sample other than the analyte being analyzed.

3.7 Milli-Q water - Specifically, a trademark of Millipore Corporation to describe ultrapure, type 1 water. This term generally is used to describe ultrapure (Type I) water that has been cleaned using many combinations of processes, usually involving deionization and a series of filters. Millipore Milli-Q water is used at MEL for method blanks and can be provided upon request for various project blanks.

3.8 MSDS - Material Safety Data Sheet: These data sheets provide information about a chemical’s properties along with health and safety data. Other information about the chemical manufacturer, fire-fighting procedures, protective equipment requirements, and spill clean up procedures are also provided.

3.9 QAPP - Quality Assurance Project Plan

3.10 Reagent – Solvent or compound used in chemical processes or analysis.

3.11 Reagent grade – Of satisfactory purity to be used for chemical processes or analysis.

3.12 Type IV – Water that conforms to the standards of ASTM Type IV Reagent Water specifications. This is the type of water available in the cleaning room at Ecology Headquarters. The water purifier at Headquarters uses reverse osmosis, adsorption, and de-ionization to produce Reagent Water.

4.0 Personnel Qualifications/Responsibilities

4.1 Because this procedure requires the use of hazardous materials, training is required as described in the Ecology Chemical Hygiene Plan and Hazardous Material Handling Plan (Section 1) (WA State Department of Ecology, 2011) which includes Laboratory Safety Orientation, Job-Specific Orientation and Chemical Safety Procedures. Follow the Standard
Operating Procedures in Section 16 of the Chemical Hygiene Plan and Hazardous Material Handling Plan for handling chemicals.

5.0 Equipment, Reagents, and Supplies

5.1 Heavy-duty aluminum foil.

5.2 Personal protective equipment.
5.2.1 Eye protection.
5.2.2 Apron.
5.2.3 Gloves for solvents and acids (see Chemical Hygiene Plan and Hazardous Material Handling Plan (Section 6) (WA State Department of Ecology 2011).

5.3 Fume hood.

5.4 Stainless steel bowls for collecting used solvents.

5.5 Glass funnel.

5.6 Empty glass bottles for properly disposing of used solvents (see Chemical Hygiene Plan and Hazardous Material Handling Plan (Section 11) (WA State Department of Ecology 2011).

5.7 Cleaning brushes.

5.8 Wash bottles for solvents.

5.9 Decontaminating fluids.
5.9.1 Tap water.
5.9.2 Deionized water (DI).
5.9.3 10% reagent grade nitric acid. See Attachment 6 for MSDS. Dilute reagent grade nitric acid to 10% with DI water.
5.9.4 Acetone, Certified ACS HPLC Grade ≥99.5%. See Attachment 2 for MSDS. See Section 9.0 of this document for safety requirements.
5.9.5 Hexane, Certified ACS HPLC Grade ≥99.5%. See Attachment 3 for MSDS. See Section 9.0 of this document for safety requirements.
5.9.6 Methanol, Certified ACS Reagent Grade ≥99.8%. See Attachment 5 for MSDS. See Section 9.0 of this document for safety requirements.
5.9.7 Isopropanol ACS, Ultrapure ≥99.9%. See Attachment 4 for MSDS. See Section 9.0 of this document for safety requirements.
5.9.8 Liqui-Nox® (biodegradable, phosphate-free, interfering-residue free, concentrated soap from Valconox®, Inc.).
5.10 Blank rinse water (Milli-Q water can be provided by MEL upon request, this is the same water that MEL uses for method blanks).

5.11 Certified contaminant-free sample containers.

5.12 Talc-free nitrile exam gloves.

5.13 Sink and drainboard.

6.0 **Introduction to Decontamination.**

6.1 To obtain reliable and usable data from investigation of environmental toxics, it is essential to effectively decontaminate sampling equipment to prevent sample contamination or cross-contamination of samples. It is important to work in a clean environment while decontaminating equipment. This includes using verifiably clean solvents, including deionized water (DI), blank rinse water, and nitric acid.

There are several factors to consider when selecting a cleaning procedure. A project manager must consider the objectives of the study, target analytes, anticipated concentration of analytes, data quality objectives, method detection limits, media to be sampled, composition of sampling equipment, and safety of cleaning procedures.

6.1.1 Target analytes must be considered in order to select an appropriate method of decontamination. Dilute (10%) nitric acid is commonly used to decontaminate equipment for sampling inorganic contaminants such as metals (EPA, 2011; ASTM 2008). Organic contaminants are removed using organic solvents such as isopropanol, acetone, hexane, or methanol (EPA, 2011; ASTM 2008). EPA guidance recommends using methanol when sampling for perfluorinated compounds (EPA, 2011). Acetone and isopropanol residues can interfere with high resolution gas chromatography-mass spectrometry analysis of volatile organic compounds (VOCs) (personal communication, John Weakland and Joel Bird). When sampling for VOCs, use methanol as the solvent to decontaminate equipment. EPA Method 8260B uses methanol to prepare surrogate and internal standards during analysis of VOCs.

It is important to know the polarity of the target analyte as polar solvents will dissolve polar contaminants (Parker and Ranney, 2000). The polarity of the recommended solvents is displayed in Table 1. By understanding the relationship between the polarity of the solvent and the analyte, the project manager can select a solvent that will decontaminate effectively and reduce or eliminate potential contamination of a sample. Recommended solvents for decontaminating sampling equipment are presented in Table 2.
**Table 1. Polarity of Recommended Decontamination Solvents.**

<table>
<thead>
<tr>
<th>Solvent</th>
<th>Polarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol</td>
<td>0.762</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>0.546</td>
</tr>
<tr>
<td>Acetone</td>
<td>0.355</td>
</tr>
<tr>
<td>Hexane</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Source: Reichardt, 2003

**Table 2. Recommended Solvents for Decontaminating Equipment for Analytes of Interest**

<table>
<thead>
<tr>
<th>Recommended Solvent:</th>
<th>Polycyclic Aromatic Hydrocarbons</th>
<th>Polychlorinated Biphenyls</th>
<th>Non-Polar Pesticides-Organochlorine Pesticides, DDT, Dieldrin, Toxaphene, etc</th>
<th>Dioxins/Furans</th>
<th>Polybrominated Diphenyl Ethers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isopropyl Alcohol or Acetone</td>
<td>Pharmaceuticals</td>
<td>Many Emerging Contaminants</td>
<td>Polar Pesticides-Many Herbicides, Some Organophosphate Pesticides Semi-Volatile Organic Compounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10% Nitric Acid</td>
<td></td>
<td></td>
<td></td>
<td>Metals</td>
<td></td>
</tr>
<tr>
<td>Volatile Organic Compounds</td>
<td>Perfluorinated Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.1.2 The expected concentration of analytes in the sampled media will be a factor in selecting the decontamination method. Higher levels of contamination on sampling equipment will require more time and effort to decontaminate effectively. Beginning sampling with cleaner media and progressing towards more contaminated media can reduce cross-contamination of samples. A sample with an expected low level of an analyte will require extremely thorough cleaning as very low levels of contamination on the sampling equipment can drastically affect the results of analysis.

6.1.3 The effectiveness of decontamination procedures is an important factor when establishing data quality objectives during project planning. Equipment rinse blanks can help the project manager assess whether the cleaning procedures have been effective and meet data quality objectives (see section 8.0, Quality Control and Quality Assurance).
6.1.4 The analytical detection limit (DL) for the sampled media can be a factor in deciding the decontamination procedure to be used. Ideally, any contamination of the sample from the sampling equipment should be well below the detection limit. An analytical method with a high DL does not imply that less stringent cleaning methods are necessary. The additive effects of residual surface contamination on sampling equipment could lead to analytical results that are biased high.

6.1.5 The type of media that is being sampled will determine the amount of effort required to clean sampling equipment. Grossly contaminated equipment used to sample concentrated or pure contaminants, fish tissue, oily media, or sediments will require more physical cleaning than equipment used to sample water. Fish tissue should be rinsed off sampling equipment with cold water before decontamination; hot water will cook the tissue to the equipment. Physical removal of surface contaminants with hot water, a surfactant such as Liquinox®, and a clean non-reactive brush will prepare equipment to be effectively decontaminated with the appropriate acids and/or solvents.

6.1.6 When cleaning sampling equipment, consider the material that the equipment is made of. Some materials can be damaged by acids and solvents used for cleaning. For example, acetone will damage acrylic sleeves used in sediment traps. Acids may damage some plastics. When there is doubt whether an acid or solvent will damage a piece of equipment, test the desorbing agent on a part of the equipment that does not contact a sample during sample collection.

Keep in mind that non-permeable equipment, i.e. stainless steel or glass, will not absorb contaminants, but the contaminants will adsorb to the surface of the equipment. Non-permeable equipment can usually be cleaned and used again. If sampling equipment is constructed of permeable materials that will absorb contaminants while sampling, they will not be able to be cleaned and reused.

6.1.7 Acids and solvents used in decontamination procedures are hazardous substances. Ecology personnel cleaning equipment with these chemicals must be familiar with the latest version of the Chemical Hygiene Plan & Hazardous Materials Management Plan.

6.1.7.1 Always read the Material Safety Data Sheet (MSDS) for any acid or solvent before use.

6.1.7.2 Wear appropriate personal protective equipment, e.g. gloves, eyewear, and apron when decontaminating equipment.

6.1.7.3 Always use a fume hood or adequate ventilation when solvent rinsing equipment.

6.2 See Figure 1 for a flow chart of recommended decontamination procedures.
†See Table 2 for recommended solvents.

*Match the polarity of the solvent to the polarity of the contaminant that will be sampled (see section 6.1.1.). Isopropyl alcohol and acetone are effective general cleaning solvents that are mostly polar but also have non-polar characteristics. Hexane is a solvent that works well for desorbing non-polar contaminants. When sampling for perfluorinated compounds, EPA guidance recommends methanol as a cleaning solvent (EPA, 2011).

Figure 1. General procedure for decontaminating equipment when sampling for organic or inorganic contaminants.
7.0 Procedure

7.1 Start with a clean work area.

7.1.1 Wipe down countertops with a clean sponge to remove dust and other debris.

7.1.2 Cover all surfaces where equipment will be set down (fume hood, drying rack) with new aluminum foil, dull side up.

7.2 Physical removal of surface contaminants is the first step of decontaminating sampling equipment.

7.2.1 Rinse off surface contaminants using tap water. Cold water will work better to remove animal tissue. Hot water will work better for other matrices.

7.2.2 Scrub equipment until clean using a clean brush, Liquinox®, and hot water.

7.2.3 Rinse equipment with hot tap water.

7.2.4 Rinse equipment with deionized water.

7.2.4.1 The project manager should consider the source and purity of DI. Two types of DI are available to Ecology staff. Type IV water is produced by the water purifier in the cleaning room at Headquarters. Type I, milli-Q water is available by request from MEL. A project manager should decide which type of DI to use depending on the measurement quality objectives of the study.

7.2.4.1 Deionized water must be routinely tested to assure that no contaminants of concern are present.

7.3 If sampling for inorganics, rinse all surfaces of equipment with 10% reagent grade nitric acid.

7.3.1 Rinse equipment with deionized water (Type IV or better).

7.4 If sampling for organic compounds, a solvent rinse is required.

7.4.1 High purity solvents must be used. Recommended solvents are isopropyl alcohol (Ultrapure ≥99.9%), Acetone (Certified ACS HPLC Grade ≥99.5%), Hexane (Certified ACS HPLC Grade ≥99.5%), and Methanol (Certified ACS Reagent Grade ≥99.8%).

7.4.2 Project Managers should choose cleaning solvents by matching the polarity of a contaminant of interest to the solvent (see section 6.1.1). Choose a solvent that will not interfere with sample analysis.
7.4.2.1 Polar contaminants include but are not limited to:

- Many pesticides
  - Carbamates
  - Organophosphates
- Many wastewater related chemicals or emerging contaminants
  - Hormones
  - Pharmaceuticals
  - Personal care products

Polar environmental contaminants are hydrophilic and are highly soluble in water (low $K_{ow}$). Isopropyl alcohol and acetone are mostly polar, but do have some non-polar characteristics. Having polar and non-polar characteristics, isopropyl alcohol and acetone are effective general cleaning solvents. Methanol is strongly polar with a polarity of 0.762.

7.4.2.2 Non-polar contaminants include but are not limited to:

- Polychlorinated biphenyls
- Polybrominated diphenyl ethers
- Polycyclic aromatic hydrocarbons
- Volatile and semi-volatile compounds
- Chlorinated pesticides
- Dioxins and furans

Low polarity environmental contaminants are hydrophobic and have low solubility in water (high $K_{ow}$). Hexane is an effective non-polar solvent with a polarity of 0.009.

7.4.2.3 EPA guidance recommends methanol to decontaminate equipment which will be used to sample perfluorinated compounds (EPA, 2011).

7.4.2.4 When sampling for extremely low levels of analyte (ppt or smaller), consider using one time use sampling methods such as recycleable transfer jars. This greatly reduces the possibility of sample contamination, which is common when low level analysis is conducted.

7.4.3 Rinse all surfaces of the sampling equipment with the appropriate cleaning solvent.

7.4.3.1 Solvents and solvent wash bottles are located in the corrosive and flammable cabinets in the cleaning room. Use these wash bottles to rinse equipment placed on clean foil inside the fume hood. Collect used solvent and acids and store properly until disposal as described in section 11.0 of the Chemical Hygiene Plan.

7.4.4 If sampling for Volatile Organic Compounds (VOCs), proceed to step 7.4.4.1. If not sampling for these compounds, proceed to 7.4.5.
7.4.4.1 Acetone and isopropanol residues can interfere with high resolution gas chromatography-mass spectrometry analysis of VOCs (personal communication, John Weakland and Joel Bird). When cleaning equipment used for sampling matrices to be analyzed for VOCs, use methanol for the solvent rinse.

7.4.5 Let air dry under a fume hood.

7.4.6 After all solvent has evaporated from the equipment, wrap with new aluminum foil, dull side in for transport to the field.

7.5 Links to other Ecology guidance on equipment decontamination can be found in Attachment 1 of this document.

8.0 Quality Control and Quality Assurance

8.1 Evaluating and documenting the effectiveness of decontamination is essential to obtaining reliable data on environmental toxics. Every toxics QAPP should outline the QA/QC procedures used to ensure effective decontamination. Blank rinses on cleaned equipment will help the project manager to determine if decontamination procedures are sufficient to meet project objectives.

8.2 Analyzing equipment rinse blanks before sampling starts can prevent costly contamination issues during the field component of a project.

8.3 If contaminants of concern are detected in blank water equipment rinses, further investigation will be required to determine the source of contamination.

8.3.1 A more thorough cleaning of equipment may yield a clean equipment rinse blank.

8.3.2 The purity of solvents, including DI water should be analytically verified when analyzing samples for low levels of analyte. Contamination during the cleaning process could affect the outcome of an equipment rinse. Consider using one time use containers to sample low levels of contaminants (see 7.4.2.4).

8.3.2.1 The purity of blank water should be routinely established. Blank samples are collected at appropriate times throughout a series of samples to verify that sample containers are clean, sampling procedures have not introduced contamination, and there are no pollutants that have been introduced during laboratory procedures. If the purity of blank water is not known, it will be difficult if not impossible for a project manager to identify potential sources of contamination. See Table 3 for information about which types of blanks will assess possible sample contamination sources.
### Table 3. Types of Blanks and the Contamination Source(s) Potentially Identified

<table>
<thead>
<tr>
<th>Type of Blank</th>
<th>Potential Origin of Contamination</th>
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<tbody>
<tr>
<td>Method Blank</td>
<td>Lab environment, blank water, and/or analytical instrumentation</td>
</tr>
<tr>
<td>Blank Water Blank</td>
<td>Same as method blank</td>
</tr>
<tr>
<td>Transfer Blank</td>
<td>Sample containers, and/or field procedures</td>
</tr>
<tr>
<td>Transport Blank</td>
<td>Environment during sample transport</td>
</tr>
<tr>
<td>Equipment Rinse Blank</td>
<td>Decontamination procedures, and/or lab environment</td>
</tr>
</tbody>
</table>

**9.0 Safety**

9.1 Decontamination procedures should only be conducted by personnel with previous experience or under the supervision of someone with experience.

9.2 Because this procedure requires the use of hazardous materials (solvents and acid), Ecology personnel must read and understand the safety procedures described in Ecology’s Chemical Hygiene Plan & Hazardous Materials Management Plan, 2011.

9.3 Always follow procedures described in the Chemical Hygiene Plan for the safe and proper use and disposal of solvents and chemicals. Read the appropriate attached Material Safety Data Sheet (MSDS) for the solvents and acid that will be used for decontamination procedures.

9.4 Be sure to use the appropriate Personal Protective Equipment and know how to use it correctly. This information is covered in section 6.0 of the Chemical Hygiene Plan. Table 4 displays the effectiveness of various protective gloves when used with the recommended solvents.
Table 4. Protective Gloves and Their Resistance to Cleaning Solvents

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Neoprene</th>
<th>Natural Latex or Rubber</th>
<th>Butyl</th>
<th>Nitrile Latex</th>
<th>Laminate Film (such as Silver Shield)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>NR</td>
<td>E</td>
</tr>
<tr>
<td>Hexane</td>
<td>E</td>
<td>NR</td>
<td>P</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Methanol</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Nitric Acid 10% (Concentrated)</td>
<td>E</td>
<td>G</td>
<td>-</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Nitric Acid 70% (Concentrated)</td>
<td>E</td>
<td>NR</td>
<td>-</td>
<td>NR</td>
<td>E</td>
</tr>
</tbody>
</table>

E=Excellent, G=Good, F=Fair, P=Poor, NR=Not Recommended


9.5 Understand the chemical spill emergency procedures explained in section 12.0 of the Chemical Hygiene Plan.

9.6 Contact the room custodian and/or the safety officer if any accident occurs, if first aid supplies are inadequate, if chemical spills occur, or for any other need or questions. The names and numbers of the room custodian and the safety officer are posted in the room. In extreme emergency call 911.

10.0 References


Attachment 1. Other Ecology Guidance that Outline Cleaning Procedures.

EAP007 - Resecting Finfish Whole Body, Body parts or Tissue Samples, Sandvik, 2010.
EAP038 - Collection of Freshwater Core Samples Using a Box or KB Corer, Furl and Meredith, 2008.
EAP040 - Freshwater Sediment Sampling, Blakley, 2008.
EAP 041 - Collecting Freshwater Suspended Particulate Matter Samples using In-Line Filtration, Meredith, 2008.

These Ecology standard operating procedures can be found at the [Environmental Assessment Quality Assurance](#) page.

Decontamination procedures are also addressed in section 16.2 of the Ecology Chemical Hygiene Plan & Hazardous Materials Management Plan. Safety protocols are also covered in this document.
Attachment 2. Acetone MSDS

Fisher Scientific
Part of Thermo Fisher Scientific
Material Safety Data Sheet

Create Date 28-Apr-2009  Revision Date 07-Mar-2011  Revision Number 3

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Acetone
Cat No.
A9-4; A9-20; A9-200; A11-1; A11-4; A11-20; A11-200; A11S-4; A16F-
1GAL; A16P-1GAL; A16P-4; A16S-4; A16S-20; A18-1; A18-4; A18-20;
A18-200; A18-200LC; A18-500; A18CU1300; A18FB-19; A18FB-50;
A18FB-115; A18FB-200; A18P-4; A18POP-19; A18POP-50; A18RB-19;
A18RB-50; A18RB-115; A18RB-200; A18RS-28; A18RS-50; A18RS-115;
A18RS-200; A18S-4; A18SK-4; A18SS-19; A18SS-28; A18SS-50; A18SS-
115; A18SS-200; A19-1; A19-4; A19RS-115; A19RS-200; A40-4; A928-4;
A929-1; A929-4; A929RS-19; A929RS-50; A929RS-200; A929SK-4;
A929SS-28; A929SS-50; A929SS-115; A929SS-200; A946-4; A946-4LC;
A946FB-200; A946RB-19; A946RB-50; A946RB-115; A946RB-200; A949-
1; A949-4; A949CU-50; A949N-119; A949N-219; A949POP-19; A949RS-
28; A949RS-50; A949RS-115; A949SK-1; A949SK-4; A949SS-19; A949SS-
28; A949SS-50; A949SS-115; A949SS-200; BP2403-1; BP2403-4; BP2403-
20; BP2404-1; BP2404-4; BP2404SK-1; BP2404SK-4; HC-300-1GAL;
22050131; 22050295

Synonyms: 2-Propanone; Dimethyl ketone; (Certified ACS, HPLC, OPTIMA, Histological, Spectranalyzed,
NF/FCC/EP, Pesticide, Electronic, GC Resolv, SAFE-COTE)

Recommended Use: Laboratory chemicals

Company: Fisher Scientific
One Reagent Lane
Fairlawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887
2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview
Flammable liquid and vapor. Irritating to eyes and skin. May cause irritation of respiratory tract. Vapors may cause drowsiness and dizziness. Repeated exposure may cause skin dryness or cracking.

Appearance Colorless Physical State Liquid odor sweet

Target Organs Central nervous system (CNS), Eyes, Respiratory system, Skin, Kidney, Liver, spleen

Potential Health Effects

Acute Effects

Principle Routes of Exposure

Eyes
Irritating to eyes.

Skin
Irritating to skin. May be harmful in contact with skin. Repeated exposure may cause skin dryness or cracking.

Inhalation
Inhalation may cause central nervous system effects. May cause drowsiness and dizziness. May cause irritation of respiratory tract. May be harmful if inhaled.

Ingestion
Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May be harmful if swallowed.

Chronic Effects
Experiments have shown reproductive toxicity effects on laboratory animals. May cause adverse liver effects. May cause adverse kidney effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Haz/Non-haz Component</th>
<th>CAS-No</th>
<th>Weight%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately if symptoms occur.

Ingestion
Do not induce vomiting. Obtain medical attention.

Notes to Physician
Treat symptomatically.

5. FIRE-FIGHTING MEASURES
5. FIRE-FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point Method</td>
<td>No information available.</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>455°C / 869°F</td>
</tr>
<tr>
<td>Explosion Limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>12.8 vol%</td>
</tr>
<tr>
<td>lower</td>
<td>2.5 vol%</td>
</tr>
<tr>
<td>Suitable Extinguishing Media</td>
<td>C02, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.</td>
</tr>
<tr>
<td>Unsuitable Extinguishing Media</td>
<td>Water may be ineffective.</td>
</tr>
<tr>
<td>Hazardous Combustion Products</td>
<td>No information available.</td>
</tr>
<tr>
<td>Sensitivity to mechanical impact</td>
<td>No information available.</td>
</tr>
<tr>
<td>Sensitivity to static discharge</td>
<td>No information available.</td>
</tr>
</tbody>
</table>

Specific Hazards Arising from the Chemical
Flammable. Risk of ignition. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions
Should not be released into the environment.

Methods for Containment and Clean Up
Remove all sources of ignition. Soak up with inert absorbent material. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>TWA: 500 ppm STEL: 750 ppm</td>
<td>(Vacated) TWA: 750 ppm</td>
<td>IDLH: 2500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) TWA: 1800 mg/m³</td>
<td>TWA: 250 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) STEL: 2400 mg/m³</td>
<td>TWA: 590 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) STEL: 1000 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 1000 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 2400 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Component

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>TWA: 500 ppm TWA: 1190 mg/m³ STEL: 1000 ppm STEL: 2380 mg/m³</td>
<td>TWA: 1000 ppm STEL: 1260 ppm</td>
<td>TWA: 500 ppm STEL: 750 ppm</td>
</tr>
</tbody>
</table>

NIOSH IDLH: Immediately Dangerous to Life or Health

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Wear appropriate protective gloves and clothing to prevent skin exposure.

Skin and body protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State
Liquid
Appearance
Colorless
odor
sweet
Odor Threshold
No information available.
pH
No information available.
 Vapor Pressure
247 mbar @ 20 oc
Vapor Density
2.0 (Air= 1.0)
Viscosity
0.32 mPa.s @ 20 oc
Boiling Point/Range
56°C / 132.8°F
Melting Point/Range
-95°C / -139°F
Decomposition temperature
> 4°C
Flash Point
-20°C / -4°F
Evaporation Rate
5.6 (Butyl Acetate = 1.0)
Specific Gravity
0.790
Solubility
Soluble in water
log Pow
58.08
Molecular Weight
C₃ H₆₀

10. STABILITY AND REACTIVITY
10. STABILITY AND REACTIVITY

Stability
Stable under normal conditions.

Conditions to Avoid
Incompatible products. Heat, flames and sparks.

Incompatible Materials
Strong oxidizing agents, Strong reducing agents, Strong bases, Peroxides

Hazardous Decomposition Products
Carbon monoxide (CO), Carbon dioxide (CO2), Formaldehyde, Methanol

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>5800 mg/kg ( Rat )</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Irritation
Irritating to eyes and skin

Toxicologically Synergistic Products
Carbon tetrachloride; Chloroform; Trichloroethylene; Bromodichloromethane; Dibromochloromethane; N-nitrosodimethylamine; 1,1,2-Trichloroethane; Styrene; Acetonitrile, 2,5-Hexanedione; Ethanol; 1,2-Dichlorobenzene

Chronic Toxicity

Carcinogenicity
There are no known carcinogenic chemicals in this product

Sensitization
No information available.

Mutagenic Effects
Mutagenic effects have occurred in experimental animals.

Reproductive Effects
Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects
Developmental effects have occurred in experimental animals.

Teratogenicity
Teratogenic effects have occurred in experimental animals.

Other Adverse Effects
The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

Endocrine Disruptor Information
No information available.
**12. ECOLOGICAL INFORMATION**

Ecotoxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Not listed</td>
<td>Leuciscus idus: LC50 = 11300 mg/L/48h, Salmo gairdneri: LC50 = 6100 mg/L/24h</td>
<td>EC50 = 14500 mg/L/15 min</td>
<td>EC50 = 39 mg/L/48h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 = 12700 mg/L/48h</td>
<td>EC50 = 12600 mg/L/48h</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Readily biodegradable.

Bioaccumulation/Accumulation
No information available

Mobility

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

**13. DISPOSAL CONSIDERATIONS**

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA- U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>U002</td>
<td></td>
</tr>
</tbody>
</table>

**14. TRANSPORT INFORMATION**

DOT

<table>
<thead>
<tr>
<th>UN-No</th>
<th>UN1090</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ACETONE</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>

TOG

<table>
<thead>
<tr>
<th>UN-No</th>
<th>UN1090</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ACETONE</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>

IATA

<table>
<thead>
<tr>
<th>UN-No</th>
<th>UN1090</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ACETONE</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>
14. TRANSPORT INFORMATION

IMDG/IMO
UN-No  UN1090
Proper Shipping Name  ACETONE
Hazard Class  3
Packing Group  II

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>EUNCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>CHINA</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-662-2</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e., Partial Updating of the TSCA Inventory Database Production and Site Reports (40 CFR 710(8)).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)  Not applicable

SARA 313
Not applicable

SARA 311/312 Hazardous Categorization

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clean Water Act
Not applicable

Clean Air Act
Not applicable
OSHA
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>5000 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65
This product does not contain any Proposition 65 chemicals.

State Right-to-Know

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant: N
DOT Severe Marine Pollutant: N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>DHS Chemical Facility</th>
<th>Anti-Terrorism Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td></td>
<td>2000 lb STQ</td>
</tr>
</tbody>
</table>

Other International Regulations

Mexico- Grade
Serious risk, Grade 3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
82 Flammable liquid
028 Toxic materials
16. OTHER INFORMATION

Prepared By  Regulatory Affairs  
Thermo Fisher Scientific  
Email: EMSDS.RA@thermofisher.com  

Creation Date  28-Apr-2009  
Print Date  07-Mar-2011  
Revision Summary  ******, and red text indicates revision  

Disclaimer  
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.  

End of MSDS
1. PRODUCT AND COMPANY IDENTIFICATION

Product Name    Hexane

Synonyms   n-Hexane with < 5% various methyl pentanes; Ligroine; Naphtha Solvent (Anhydrous/Certified ACS/Pesticide/HPLC/OPTIMA/GC Resolv/Spectranalyzed/Technical/Laboratory)

Recommended Use   Laboratory chemicals

Company Fisher
Scientific One
Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview
Extremely flammable liquid and vapor. Inhalation may cause central nervous system effects. Irritating to eyes and skin. May cause irritation of respiratory tract. Aspiration hazard if swallowed - can enter lungs and cause damage. Danger of serious damage to health by prolonged exposure. Possible risk of impaired fertility. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Appearance Colorless
Physical State Liquid
odor Petroleum distillates
2. HAZARDS IDENTIFICATION

Target Organs
Skin, Respiratory system, Eyes, Central nervous system (CNS), Heart, Blood, Liver, Reproductive System

Potential Health Effects

Acute Effects

Principle Routes of Exposure

- **Eyes**: Irritating to eyes.
- **Skin**: Irritating to skin. May be harmful in contact with skin.
- **Inhalation**: May be harmful if inhaled. Inhalation may cause central nervous system effects. May cause irritation of respiratory tract.
- **Ingestion**: Aspiration hazard. May be harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chronic Effects
Tumorigenic effects have been reported in experimental animals. Experiments have shown reproductive toxicity effects on laboratory animals. Possible risk of impaired fertility. Danger of serious damage to health by prolonged exposure. May cause adverse liver effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions
Central nervous system disorders. Preexisting eye disorders. Skin disorders.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Haz/Non-haz</th>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hexane</td>
<td>110-54-3</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

- **Eye Contact**: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
- **Skin Contact**: Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.
- **Inhalation**: Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Obtain medical attention.
- **Ingestion**: Do not induce vomiting. Call a physician or Poison Control Center immediately.
- **Notes to Physician**: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

- **Flash Point**: -22°C / -7.6°F
- **Method**: No information available.
- **Autoignition Temperature**: 223°C / 433.4°F
- **Explosion Limits**: Upper 7.5 vol %
**Lower** 1.1 vol %

**Suitable Extinguishing Media**
CO₂, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media**
Water may be ineffective. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained.

**Hazardous Combustion Products**
No information available.

**Sensitivity to mechanical impact**
No information available.

**Sensitivity to static discharge**
No information available.

**Specific Hazards Arising from the Chemical**
Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

**NFPA**
Health 2  Flammability 3  Instability 0  Physical hazards N/A

### 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions**
Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions**
Should not be released into the environment.

**Methods for Containment and Clean Up**
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

### 7. HANDLING AND STORAGE

**Handling**
Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges.

**Storage**
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.
8. EXPOSURE CONTROLS/PERSOAL PROTECTION

Engineering Measures

Use only under a chemical fume hood. Use explosion-proof
electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined
areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>TWA: 50 ppm, STEL: 1000 ppm, Skin</td>
<td>(Vacated) TWA: 50 ppm, (Vacated) STEL: 1000 ppm</td>
<td>IDLH: 1100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 50 ppm, STEL: 3600 mg/m³</td>
<td>TWA: 50 ppm, Ceiling: 510 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 500 ppm, Skin</td>
<td>TWA: 180 mg/m³, Ceiling: 1800 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 1800 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>TWA: 50 ppm, STEL: 1000 ppm, Skin</td>
<td>TWA: 50 ppm, STEL: 1000 ppm</td>
<td>TWA: 50 ppm, STEL: 1000 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA: 176 mg/m³, STEL: 3500 mg/m³</td>
<td>TWA: 176 mg/m³, STEL: 3500 mg/m³</td>
<td>Skin</td>
</tr>
</tbody>
</table>

NIOSH IDLH: Immediately Dangerous to Life or Health

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s
eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN
149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits
are exceeded or if irritation or other symptoms are experienced.

9. PHYSICAL AND CHEMICAL PROPERTIES

| Physical State | Liquid |
| Appearance    | Colorless |
| odor          | Petroleum distillates |
| Odor Threshold | No information available. |
| pH            | No information available. |
| Vapor Pressure | 160 mbar @ 20 °C |
| Vapor Density | 2.97 (Air = 1.0) |
| Viscosity     | 0.31 mPa s at 20 °C |
| Boiling Point/Range | 69°C / 156.2°F @ 760 mmHg |
| Melting Point/Range | -95°C / -139°F |
| Decomposition temperature | No information available. |
| Flash Point   | -22°C / -7.8°F |
| Evaporation Rate | No information available. |
| Specific Gravity | 0.659 |
| Solubility    | Insoluble in water |
| log Pow       | No data available |
| Molecular Weight | 86.18 |
| Molecular Formula | C6 H14 |
10. STABILITY AND REACTIVITY

Stability
Stable under normal conditions.

Conditions to Avoid

Incompatible Materials
Strong oxidizing agents, Halogens

Hazardous Decomposition Products
Carbon monoxide (CO), Carbon dioxide (CO₂)

Hazardous Polymerization
Hazardous polymerization does not occur

Hazardous Reactions
None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>25 g/kg (Rat)</td>
<td>3000 mg/kg (Rabbit)</td>
<td>48000 ppm (Rat) 4 h</td>
</tr>
</tbody>
</table>

Irritation
Irritating to eyes and skin

Toxicologically Synergistic Products
No information available.
Chronic Toxicity

Carcinogenicity

There are no known carcinogenic chemicals in this product.

Sensitization

No information available.

Mutagenic Effects

Mutagenic effects have occurred in experimental animals.

Reproductive Effects

Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects

Developmental effects have occurred in experimental animals.

Teratogenicity

Teratogenic effects have occurred in experimental animals.

Other Adverse Effects

Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

Endocrine Disruptor Information

No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>Not listed</td>
<td>2.1-2.98 mg/L LC50 96 h</td>
<td>Not listed</td>
<td>EC50: 3.87 mg/L/48h</td>
</tr>
</tbody>
</table>

Persistence and Degradability

No information available.

Bioaccumulation/ Accumulation

No information available.

Mobility

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>4.11</td>
</tr>
</tbody>
</table>

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

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

14. TRANSPORT INFORMATION

DOT

UN-No: UN1208
Proper Shipping Name: Hexanes
Hazard Class: 3
Packing Group: II

TDG

UN-No: UN1208
Proper Shipping Name: HEXANES
Hazard Class: 3
<table>
<thead>
<tr>
<th>Packing Group</th>
<th>II</th>
</tr>
</thead>
</table>

**IATA**

<table>
<thead>
<tr>
<th>UN-No</th>
<th>UN1208</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Hexanes</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>

**IMDG/IMO**

<table>
<thead>
<tr>
<th>UN-No</th>
<th>UN1208</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Hexanes</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
</tbody>
</table>
14. TRANSPORT INFORMATION

Packing Group II

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>CHINA</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>203-777-6</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
- X - Listed
- E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
- F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
- N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
- P - Indicates a commenced PMN substance
- R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
- S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
- T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
- XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
- Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
- Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>110-54-3</td>
<td>&gt;95</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization
- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: Yes
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: No

Clean Water Act

Not applicable

Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depleters</th>
<th>Class 2 Ozone Depleters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OSHA
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>5000 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

California Proposition 65
This product does not contain any Proposition 65 chemicals.

State Right-to-Know

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade
Serious risk, Grade 3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
B2 Flammable liquid
D2A Very toxic materials
D2B Toxic materials
16. OTHER INFORMATION

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date
26-Oct-2009

Print Date
24-Jan-2012

Revision Summary
“***”, and red text indicates revision

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of MSD
S
1. PRODUCT AND COMPANY IDENTIFICATION

Product Name 2-Propanol

Cat No. A415-4; A415-20; A416-1; A416-4; A416-4LC; A416-20; A416-200; A416-200LC; A416-500; A416P-4; A416S-4; A416SK-4; A416FB-19; A416FB-50; A416FB-115; A416FB-200; A416RB-50; A416RB-115; A416RB-200; A416RS-28; A416RS-50; A416RS-115; A416RS-200; A416SS-28; A416SS-50; A416SS-115; A416SS-200; A417-1; A417-4; A419-1; A419-4; A419RS-28; A419RS-115; A419RS-200; A419SS-28; A419SS-50; A419SS-115; A419SS-200; A426F-1GAL; A426P-4; A426S-4; A426S-20; A426S-200; A451-1; A451-4; A451CU-50; A451N-219; A451POP-19; A451RS-19; A451RS-50; A451RS-115; A451RS-200; A451SK-1; A451SK-4; A451SS-200; A461-1; A461-4; A461-212; A461-500; A464-1; A464-4; A464-4LC; A464RS-200; A464SK-4; A516-4; A516-20; A516-200; A516-500; A519-4; A520-4; A520RS-200; A520SS-28; A520SS-50; A520SS-115; A520SS-200; A522-4; A522-20; A522SAM-1; A522SAM-2; A522SAM-3; BP2621100; BP26324; HC-500-1GAL; LCMSKIT; OPTIMAKIT

Synonyms Isopropanol; Isopropyl Alcohol (Certified ACS, HPLC, Laboratory, Histological, Spectranalyzed, OPTIMA LC/MS, USP, Pesticide, Low Water, USP/EP/BP/JP)

Recommended Use Laboratory chemicals

Company Fisher Scientific One Reagent Lane Fair Lawn, NJ 07410 Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300 CHEMTREC®, Outside the USA: 001-703-527-3887

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview
Flammable liquid and vapor. Irritating to eyes and skin. May cause irritation of respiratory tract. Vapors may cause drowsiness and dizziness. Aspiration hazard if swallowed - can enter lungs and cause damage. Hygroscopic.

Appearance Colorless Physical State Liquid odor Alcohol-like
2. HAZARDS IDENTIFICATION

Target Organs
Skin, Respiratory system, Eyes, Central nervous system (CNS), Liver, Kidney

Potential Health Effects

Acute Effects

Principle Routes of Exposure

<table>
<thead>
<tr>
<th>Eyes</th>
<th>Irritating to eyes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Irritating to skin. May be harmful in contact with skin.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>May be harmful if inhaled. May cause drowsiness and dizziness. May cause irritation of respiratory tract.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Aspiration hazard if swallowed - can enter lungs and cause damage. May cause central nervous system effects. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.</td>
</tr>
</tbody>
</table>

Chronic Effects
Experiments have shown reproductive toxicity effects on laboratory animals. May cause adverse liver effects. May cause adverse kidney effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions
Preexisting eye disorders. Skin disorders.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>67-63-0</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion
Do not induce vomiting. Obtain medical attention.

Notes to Physician
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point
12°C / 53.6°F

Method
No information available.

Autoignition Temperature
425°C / 797°F

Explosion Limits

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>12 vol %</td>
</tr>
<tr>
<td>Lower</td>
<td>2 vol %</td>
</tr>
</tbody>
</table>
Suitable Extinguishing Media
CO₂, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media
Water may be ineffective

Hazardous Combustion Products
No information available.

Sensitivity to mechanical impact
No information available.

Sensitivity to static discharge
No information available.

Specific Hazards Arising from the Chemical
Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA
Health 1  Flammability 3  Instability 0  Physical hazards N/A

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

Environmental Precautions
Should not be released into the environment.

Methods for Containment and Clean Up
Remove all sources of ignition. Soak up with inert absorbent material. Use spark-proof tools and explosion-proof equipment. Keep in suitable, closed containers for disposal. Take precautionary measures against static discharges.

7. HANDLING AND STORAGE

Handling
Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Use explosion-proof equipment. Use only non-sparking tools. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures

Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment.

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>TWA: 200 ppm</td>
<td>(Vacated) TWA: 400 ppm</td>
<td>IDLH: 2000 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 400 ppm</td>
<td>(Vacated) TWA: 980 mg/m³</td>
<td>TWA: 400 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) STEL: 500 ppm</td>
<td>TWA: 980 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 1225 mg/m³</td>
<td>STEL: 500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 980 mg/m³</td>
<td>STEL: 1225 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWA/EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>TWA: 400 ppm</td>
<td>TWA: 400 ppm</td>
<td>TWA: 200 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA: 985 mg/m³</td>
<td>TWA: 980 mg/m³</td>
<td>STEL: 400 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 1230 mg/m³</td>
<td>STEL: 500 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 1225 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

NIOSH IDLH: Immediately Dangerous to Life or Health

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>odor</td>
<td>Alcohol-like</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available.</td>
</tr>
<tr>
<td>pH</td>
<td>7.1 % aq. sol.</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>43 mmHg @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>(Air = 1.0)</td>
</tr>
<tr>
<td>Viscosity</td>
<td>2.27 mPa.s at 20 °C</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>81 - 83°C / 177.8 - 181.4°F @ 760 mmHg</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-89.5°C / -129.1°F</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No information available.</td>
</tr>
<tr>
<td>Flash Point</td>
<td>12°C / 53.6°F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>1.7 (Butyl Acetate = 1.0)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.785</td>
</tr>
<tr>
<td>Solubility</td>
<td>Miscible with water</td>
</tr>
<tr>
<td>log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>60.1</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C3 H₈ O</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability Hygroscopic.
Conditions to Avoid
Incompatible products. Heat, flames and sparks. Exposure to moist air or water.

Incompatible Materials
Strong oxidizing agents, Acids, Halogens, Acid anhydrides

Hazardous Decomposition Products
Carbon monoxide (CO), Carbon dioxide (CO₂), peroxides

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral (Rat)</th>
<th>LD50 Dermal (Rat)</th>
<th>LC50 Inhalation (Dust (Rat))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>5840 mg/kg</td>
<td>13900 mg/kg</td>
<td>72.6 mg/L 4 h</td>
</tr>
</tbody>
</table>

Irritation
Irritating to eyes and skin

Toxicologically Synergistic Products
No information available.

Chronic Toxicity

Carcinogenicity
There are no known carcinogenic chemicals in this product

Sensitization
No information available.

Mutagenic Effects
Mutagenic effects have occurred in experimental animals.

Reproductive Effects
Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects
Developmental effects have occurred in experimental animals.

Teratogenicity
Teratogenic effects have occurred in experimental animals.

Other Adverse Effects
See actual entry in RTECS for complete information.

Endocrine Disruptor Information
No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Do not empty into drains.
<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>1000 mg/L EC50 &gt; 72 h 1000 mg/L EC50 &gt; 96 h</td>
<td>140000 mg/L LC50 96 h</td>
<td>= 35390 mg/L EC50 Photobacterium phosphoreum 5 min</td>
<td>13299 mg/L EC50 = 48 h 9714 mg/L EC50 = 24 h</td>
</tr>
</tbody>
</table>

**Persistence and Degradability**
Expected to be biodegradable.

**Bioaccumulation/ Accumulation**
No information available

**Mobility**

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**13. DISPOSAL CONSIDERATIONS**

**Waste Disposal Methods**
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

**14. TRANSPORT INFORMATION**

**DOT**

- UN-No: UN1219
- Proper Shipping Name: Isopropanol
- Hazard Class: 3
- Packing Group: II

**TDG**

- UN-No: UN1219
- Proper Shipping Name: ISOPROPANOL
- Hazard Class: 3
- Packing Group: II

**IATA**

- UN-No: UN1219
- Proper Shipping Name: Isopropanol
- Hazard Class: 3
- Packing Group: II

**IMDG/IMO**

- UN-No: UN1219
- Proper Shipping Name: Isopropanol (Isopropyl alcohol)
- Hazard Class: 3
- Packing Group: II
14. TRANSPORT INFORMATION

15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>CHINA</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-661-7</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>67-63-0</td>
<td>&gt;95</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

- Acute Health Hazard: Yes
- Chronic Health Hazard: No
- Fire Hazard: Yes
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: No

Clean Water Act
Not applicable

Clean Air Act
Not applicable

OSHA
Not applicable

CERCLA
Not Applicable
California Proposition 65
This product does not contain any Proposition 65 chemicals.

State Right-to-Know

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant  N
DOT Severe Marine Pollutant  N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade
Serious risk, Grade 3

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
B2  Flammable liquid
D2B  Toxic materials

16. OTHER INFORMATION

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com
Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.
Material Safety Data Sheet

This Material Safety Data Sheet (MSDS) complies with the United Nations Globally Harmonized System (GHS) of Classification and Labeling, Second revised Edition and meets or exceeds the Canadian and United States Requirements for Hazard Communication.

1. Product and Supplier Identification

Product Name: Methanol
GHS Product Identifier: Methanol

Recommended Use: Solvent, fuel, feedstock

Restrictions on Use: Do not use in a confined area without proper ventilation. Contact lenses may cause further damage in case of splash into eye. Avoid use near heat, flames, sparks, and other sources of ignition.

Product: Methanol (CH₃OH)  Methanex Tel.: (604) 661-2600
Synonyms: Methanol, methyl hydrate, wood spirit, methyl hydroxide  Emergency Tel.: 1-800-262-8200 (CHEMTREC) (Canada and USA)

Company Identification:
Methanex Corporation
1800 Waterfront Centre
200 Burrard Street
Vancouver, B.C.
V6C 3M1

Importer: Methanex Methanol Company
15301 Dallas Parkway, Suite 900
Addison, Texas 75001
Telephone: (972) 702-0909

2. Hazards Identification

Classification: Flammable Liquid, Category 1, Acute Toxicity Category 1*, Reproductive Toxicity 1B, Specific Target Organ Toxicity (Repeated Exposure)

Label:

Hazard Communication: DANGER! Extremely flammable liquid and vapour. Fatal if swallowed. May damage fertility or the unborn child (fetotoxic and teratogenic effects). May cause damage to eyes and central nervous system if ingested or inhaled.

*Note: Assigned to classification based on human experience rather than the strict application of classification criteria set out in the Recommendations on the Transport of Dangerous Goods, Model Regulations Special Provision 279.

Hazards: Colourless liquid, with a mild, characteristic alcohol odour when pure. Crude methanol may have a repulsive, pungent odour. Hygroscopic (moisture absorbing).

Flammable Liquid and Vapour: Burns with a clean, clear flame, which is almost invisible in daylight, or a light blue flame. Can decompose at high temperatures forming carbon monoxide and formaldehyde.

Methanex Corporation  September 22, 2008
Confined space toxicity hazard. Mild central nervous system depressant following inhalation, skin absorption or ingestion. May cause headache, nausea, dizziness, drowsiness, and un-coordination. Severe vision effects, including increased sensitivity to light, blurred vision, and blindness may develop following an 8-24 hour symptom-free period. Coma and death may result.

**IRRITANT:** Causes eye irritation. Aspiration hazard. Swallowing or vomiting of the liquid may result in aspiration (breathing) into the lungs.

**POSSIBLE REPRODUCTIVE HAZARD:** May cause fetotoxic (toxic to the fetus during the latter stages of pregnancy, often through the placenta) and teratogenic effects (causing malformations of the fetus), based on animal information.

**NFPA Ratings:** (Health, Fire, Reactivity): 1, 3, 0

### 3. Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>% (w/w)</th>
<th>Exposure Limits (ACGIH)*</th>
<th>LD$_{50}$</th>
<th>LC$_{50}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (CAS 67-56-1)</td>
<td>99-100</td>
<td>ACGIH* TLV-TWA: 200 ppm, skin; TLV-STEL: 250 ppm, skin PEL-TWA: 200 ppm, skin PEL-STEL: 250 ppm, skin IDLH: 6000 ppm, acute inhalation toxicity to animals TLV Basis, critical effects: neuropathy, vision, central nervous system(CNS)</td>
<td>5628 mg/kg (oral/rat)</td>
<td>64000 ppm (inhalation/rat)</td>
</tr>
</tbody>
</table>

* Exposure limits may vary from time to time and from one jurisdiction to another. Check with local regulatory agency for the exposure limits in your area. ACGIH, American Conference of Governmental Industrial Hygienists.

### 4. First Aid Measures

**Note:** Emergency assistance may also be available from the local poison control centre.

**Eye Contact:** Remove contact lenses if worn. In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower eyelids occasionally. Obtain medical attention.

**Skin Contact:** In case of contact, remove contaminated clothing. In a shower, wash affected areas with soap and water for at least 15 minutes. Seek medical attention if irritation occurs or persists. Wash clothing before reuse. Prolonged contact with methanol may defat skin tissue, resulting in drying and cracking.

**Inhalation:** Remove to fresh air, restore or assist breathing if necessary. Obtain medical attention.

**Ingestion:** Swallowing methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion. If conscious and medical aid is not immediately available, do not induce vomiting. In actual or suspected cases of ingestion, transport to medical facility immediately.

**NOTE TO PHYSICIAN:** Acute exposure to methanol, either through ingestion or breathing high airborne concentrations can result in symptoms appearing between 40 minutes and 72 hours after exposure. Symptoms and signs are usually limited to the Central Nervous System (CNS), eyes and gastrointestinal tract. Because of the initial CNS’s effects of headache, vertigo, lethargy and confusion, there may be an impression of ethanol intoxication. Blurred vision, decreased acuity and photophobia are common complaints. Treatment with ipecac or lavage is indicated in any patient presenting within two hours of ingestion. A profound metabolic acidosis occurs in severe poisoning and serum bicarbonate levels are a
more accurate measure of severity than serum methanol levels. Treatment protocols are available from most major hospitals and early collaboration with appropriate hospitals is recommended.

Ethanol significantly decreases the toxicity of methanol because it competes for the same metabolic enzymes, and has been used to treat methanol poisoning.

5. Fire Fighting Measures

**Suitable Extinguishing Media:** Small fires: Dry chemical, CO\(_2\), water spray
Large fires: Water spray (see note in Unsuitable Extinguishing Media), AFFF(R) (Aqueous Film Forming Foam (alcohol resistant)) type with either a 3% or 6% foam proportioning system.

**Unsuitable Extinguishing Media:** General purpose synthetic foams or protein foams may work, but much less effectively. Water may be effective for cooling, but may not be effective for extinguishing a fire because it may not cool methanol below its flash point.

**Specific Hazards:** Methanol vapours may burn with an invisible flame. During a fire, carbon monoxide, carbon dioxide and irritation and toxic gases such as formaldehyde may be generated. Vapours can accumulate in confined spaces resulting in a toxicity and flammability hazard. Closed containers may rupture violently and suddenly release large quantities of methanol when exposed to fire or excessive heat for a sufficient period of time. Vapours are slightly heavier than air and may travel long distances toward sources of ignition.

**Hazardous Combustion Products:** Toxic gases and vapours; oxides of carbon and formaldehyde.

**Fire Fighting Instructions:** Methanol burns with a clean clear flame that is almost invisible in daylight. Stay upwind! Isolate and restrict area access. Concentrations of greater that 25% methanol in water can be ignited. Use fine water spray or fog to control fire spread and cool adjacent structures or containers. Contain fire control water for later disposal. Fire fighters must wear full face, positive pressure, self-contained breathing apparatus or airline and appropriate protective fire fighting clothing as per NFPA. Note that methanol fires may require proximity suits. Take care not to walk through any spilled chemical.

**Special Information:** Vapours can flow along surfaces to distant ignition sources and flash back.

6. Accidental Release Measures

**Overview:** Flammable liquid! Can burn without a visible flame. Release can cause an immediate risk of fire and explosion. Eliminate all ignition sources, stop leak and use absorbent materials. If necessary, contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapour and fire hazard. Maximize methanol recovery for recycling or re-use. Restrict access to area until completion of cleanup. Ensure cleanup is conducted by trained personnel only. Wear adequate personal protection and remove all sources of ignition. Notify all governmental agencies as required by law.

**Personal Protection:** Full face, positive pressure self-contained breathing apparatus or airline, and fire resistant protective clothing with chemical resistant splash suit must be worn. If product ignites, approach and fire fighting must be done with appropriate fire fighting clothing.

**Environmental Precautions:** Biodegrades easily in water. Methanol in fresh or salt water may have serious effects on aquatic life. A study on methanol’s toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down to carbon dioxide and water.

**Remedial Measures:** Flammable liquid. Release can cause an immediate fire/explosion hazard. Eliminate all sources of ignition, stop leak and use absorbent materials. Collect liquid with explosion proof pumps. Do not walk through spill product as it may be on fire and not visible.

**Small Spills:** Soak up spill with non-combustible absorbent material. Recover methanol and dilute with water to reduce fire hazard. Prevent spilled methanol from entering sewers, confined spaces, drains, or waterways. Restrict access to unprotected personnel. Put material in suitable, covered, labeled containers. Flush area with water.
Large Spills: If necessary, contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapour and fire hazard. Maximize methanol recovery for recycling or reuse. Collect liquid with explosion proof pumps.

7. Handling and Storage

Precautions for Handling: No smoking or open flame in storage, use or handling areas. Use explosion proof electrical equipment. Ensure proper electrical grounding procedures are in place.

Storage: Store in totally enclosed equipment, designed to avoid ignition and human contact. Tanks must be grounded, vented, and should have vapour emission controls. Tanks must be diked as per NFPA or API Standards. A flammable mixture of methanol vapour and air is possible inside a storage tank or transportation tank, and handlers should take appropriate precautions to reduce the risk of ignition. Handlers must eliminate ignition sources or purge the tank with an inert gas such as nitrogen. All equipment must be grounded - bonded when transferring product in order to avoid static discharge from the equipment, and subsequent possible fire. Avoid storage with incompatible materials. Anhydrous methanol is non-corrosive to most metals at ambient temperatures except for lead, nickel, monel, cast iron and high silicon iron. Coatings of copper (or copper alloys), zinc (including galvanized steel), or aluminum are unsuitable for storage. These materials may be attacked slowly by the methanol. Storage tanks of welded construction are normally satisfactory. They should be designed and built in conformance with good engineering practice for the material being stored. While plastics can be used for short term storage, they are generally not recommended for long-term storage due to deterioration effects and the subsequent risk of contamination.

8. Exposure Controls, Personal Protection

Occupational Controls: ACGIH* TLV-TWA: 200 ppm, skin (262 mg/m^3); TLV-STEL: 250 ppm, skin (328 mg/m^3); PEL-TWA: 200 ppm, skin; PEL-STEL: 250 ppm, skin; TLV Basis: critical effects: neuropathy, vision, central nervous system(CNS); IDLH: 6000 ppm, acute inhalation toxicity to animals

Engineering Controls: In confined areas, local and general ventilation should be provided to maintain airborne concentrations below permissible exposure limits. Ventilation systems must be designed according to approved engineering standards.

Respiratory Protection: NIOSH/OSHA recommendations for methanol concentrations in air:
   Up to 2000 ppm: supplied air respirator
   Up to 5000 ppm: supplied air respirator operated in a continuous-flow mode.
   Up to 6000 ppm: supplied air respirator with a tight-fitting facepiece operated in a continuous-flow mode; or Full-facepiece self-contained breathing apparatus or Full-facepiece supplied air respirator.

Cartridge type respirators are NOT recommended.

Emergency or Planned entry into unknown concentrations or IDLH (immediately dangerous to life or health) conditions:
Respirator selection must be done by a qualified person and be based upon a risk assessment of the work activities and exposure levels. Respirators must be fit tested and users must be clean shaven where the respirator seals to the face. Exposure must be kept at or below the applicable exposure limits and the maximum use concentration of the respirator must not be exceeded.

Positive pressure, full-facepiece self-contained breathing apparatus; or Positive pressure, full-facepiece supplied air respirator with an auxiliary positive pressure self-contained breathing apparatus.

**Skin Protection:** Butyl and nitrile rubbers are recommended for gloves. Check with manufacturer. Wear chemical resistant pants and jackets, preferably of butyl or nitrile rubber. Check with manufacturer.

**Eye and Face Protection:** Face shield and chemical splash goggles when transferring is taking place. Contact lenses should not be worn when working with methanol.

**Footwear:** Chemical resistant as specified by the workplace.

**Other:** Eyewash and showers should be located near work areas. NOTE: PPE must not be considered a long-term solution to exposure control. PPE usage must be accompanied by employer programs to properly select, maintain, clean, fit and use. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

Careful consideration must be made of the added danger of the concentration being in the LEL/UEL range and so there may be a fire/explosion hazard.

### 9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td>Liquid, clear, colourless</td>
</tr>
<tr>
<td><strong>Odour</strong></td>
<td>Mild characteristic alcohol odour</td>
</tr>
<tr>
<td><strong>Odour Threshold</strong></td>
<td>detection: 4.2 - 5960 ppm</td>
</tr>
<tr>
<td></td>
<td>(geometric mean) 160 ppm</td>
</tr>
<tr>
<td></td>
<td>recognition: 53 – 8940 ppm</td>
</tr>
<tr>
<td></td>
<td>(geometric mean) 690 ppm</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Freezing Point</strong></td>
<td>-97.8°C</td>
</tr>
<tr>
<td><strong>Boiling Point</strong></td>
<td>64.7°C</td>
</tr>
<tr>
<td><strong>Boiling Range</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Flash Point</strong></td>
<td>11.0°C</td>
</tr>
<tr>
<td><strong>Solubility</strong></td>
<td>Completely soluble</td>
</tr>
<tr>
<td><strong>Partial Coefficient</strong></td>
<td>Log P (oct) = -0.82</td>
</tr>
<tr>
<td><strong>Vapour Pressure</strong></td>
<td>12.8 kPa @ 20°C</td>
</tr>
<tr>
<td><strong>Upper Explosive Limit (UEL)</strong></td>
<td>36.5 %</td>
</tr>
<tr>
<td><strong>Lower Explosive Limit (LEL)</strong></td>
<td>6%</td>
</tr>
<tr>
<td><strong>Auto Ignition Temperature</strong></td>
<td>464°C</td>
</tr>
<tr>
<td><strong>Solvent Solubility</strong></td>
<td>Soluble in all proportions in ethanol, benzene, other alcohols, chloroform, diethyl ether, other ethers, esters, ketones and most organic solvents</td>
</tr>
<tr>
<td><strong>Critical Temperature</strong></td>
<td>239.4°C</td>
</tr>
<tr>
<td><strong>Specific Gravity</strong></td>
<td>0.791 @ 20°C</td>
</tr>
<tr>
<td><strong>Evaporation Rate</strong></td>
<td>4.1 (n-butyl acetate =1)</td>
</tr>
<tr>
<td><strong>Vapour Density</strong></td>
<td>1.105 @ 15°C (air = 1)</td>
</tr>
<tr>
<td><strong>Decomposition Temperature</strong></td>
<td>Not determined</td>
</tr>
<tr>
<td><strong>Sensitivity to Impact</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Sensitivity to Static Charge</strong></td>
<td>Low</td>
</tr>
</tbody>
</table>

### 10. Stability and Reactivity

**Chemical Stability:** Stable as supplied.

**Hazardous Reactions:** Yes. Avoid contact with strong oxidizers, strong mineral or organic acids, and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium, and platinum.

**Conditions to Avoid:** Avoid contact with sparks, heat, open flame, or ignition sources.

**Incompatibility:** Yes. Avoid contact with strong oxidizers, strong mineral or organic acids, and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium, and platinum. May react with metallic aluminum or magnesium and generate hydrogen gas. May attack some forms of plastic, rubber, and coatings.

**Hazardous Decomposition Products:** Formaldehyde, carbon dioxide, and carbon monoxide.

**Hazardous Polymerization:** Will not occur.
11. Toxicological Information

Signal Word/Label: DANGER! Extremely flammable liquid and vapour. Fatal if swallowed.
May damage fertility or the unborn child (fetotoxic and teratogenic effects).
May cause damage to eyes and central nervous system if ingested or inhaled.

Primary Routes of Entry:

Skin Contact: Yes
Skin Absorption: Yes
Eye Contact: Yes
Ingestion: Yes
Inhalation: Yes

Emergency Overview: Colourless liquid, with a mild, characteristic alcohol odour when pure. Crude methanol may have a repulsive, pungent odour. Hygroscopic. Can decompose at high temperatures forming carbon monoxide and formaldehyde. Confined space toxicity hazard. Mild central nervous system depressant following inhalation, skin absorption or ingestion. May cause headache, nausea, dizziness, drowsiness, and incoordination. Severe vision effects, including increased sensitivity to light, blurred vision, and blindness may develop following an 8-24 hour symptom-free period. Coma and death may result. Causes eye irritation. Aspiration hazard. Swallowing or vomiting of the liquid may result in aspiration (breathing) into the lungs. May cause fetotoxic (toxic to the fetus during the latter stages of pregnancy, often through the placenta) and teratogenic effects (causing malformations of the fetus), based on animal information.

Acute Exposure:

Inhalation: Inhalation of high airborne concentrations can also irritate mucous membranes, cause headaches, sleepiness, nausea, confusion, loss of consciousness, digestive and visual disturbances and even death. NOTE: Odour threshold of methanol is several times higher than the TLV-TWA. Depending upon severity of poisoning and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects. Concentrations in air exceeding 1000 ppm may cause irritation of the mucous membranes.

Skin Contact: Methanol is moderately irritating to the skin. Methanol can be absorbed through the skin and harmful effects have been reported by this route of entry. Effects are similar to those described in “Inhalation”.

Eye Contact: Methanol is a mild to moderate eye irritant. High vapour concentration or liquid contact with eyes causes irritation, tearing and burning.

Ingestion: Swallowing even small amounts of methanol could potentially cause blindness or death. Effects of sub lethal doses may be nausea, headache, abdominal pain, vomiting and visual disturbances ranging from blurred vision to light sensitivity.

Chronic Exposure:

Irritancy: Prolonged contact with skin may defat tissue causing dermititis or aggravate existing skin problems.

Sensitization: None reported.
Carcinogenicity: Not listed by IARC, NTP, ACGIH, or OSHA as a carcinogen.

Teratogenicity: Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations of methanol vapours.

Reproductive Toxicity: Information available does not suggest that methanol is a reproductive toxin.

Mutagenicity: There is insufficient information available to conclude that methanol is mutagenic.

Synergistic Products: In animals, high concentrations of methanol can increase the toxicity of other chemicals, particularly liver toxins like carbon tetrachloride. Ethanol significantly reduces the toxicity of methanol because it competes for the same metabolic enzymes, and has been used to treat methanol poisoning.

Potential for Accumulation: Methanol is readily absorbed into the body following inhalation and ingestion. Skin absorption may occur if the skin is broken or exposure is prolonged. Once absorbed, methanol is rapidly distributed to body tissues. A small amount is excreted unchanged in exhaled air and the urine. The rest is first metabolized to formaldehyde, which is then metabolized to formic acid and/or formate. The formic acid and formate are eventually converted to carbon dioxide and water. In humans, methanol clears from the body, after inhalation or oral exposure, with a half-life of 1 day or more for high doses (greater than 1000 mg/kg) or about 1.5-3 hours for low doses (less than 100 mg/kg or 76.5-230 ppm (100-300 mg/m³)).

Medical Conditions Aggravated By Exposure: Persons with pre-existing skin disorders, eye problems, respiratory conditions, or impaired liver or kidney functions may be more susceptible to the effects of this substance.

12. Ecological Information

Environmental toxicity: DO NOT discharge into sewer or waterways.

Methanol:

**LC₅₀**
- Pimephales promelas (fathead minnows) 29.4 g/L/96 hr, (28-29 days old), confidence limit = 28.5-30.4; Test conditions: Water temp = 25°C, dissolved oxygen = 7.3 mg/L, water hardness = 43.5 mg/L CaCO₃, alkalinity = 46.6 CaCO₃, tank volume = 6.3 L, additions = 5.71 V/D, pH = 7.66
- LC₅₀ Pimephales promelas (Fathead minnow, 28-32 day old, 0.126 g) 29,700 mg/L/24 hr; flow-through, 23.3+/−1.7°C, hardness 46.4 mg/L CaCO₃, pH 7.0-8.0
- LC₅₀ Pimephales promelas (Fathead minnow, 30 day old 0.12 g) 28,100 mg/L/24 hr; flow-through, 24-26°C, hardness 45.5 mg/L CaCO₃, pH 7.5
- LC₅₀ Daphnia pulex (Water flea, <24 hr old) 19,500 mg/L/18 hr; static, 22°C, hardness 23+/−2 mg/L CaCO₃
- EC₅₀ Daphnia obtusa (Water flea, <24 hr old; immobilization) 23,500 mg/L/24 hr; static, 20+/−2°C, hardness 250 mg/L CaCO₃, pH 7.8+/−0.2
- EC₅₀ Daphnia obtusa (Water flea, <24 hr old; immobilization) 22,200 mg/L/48 hr; static, 20+/−2°C, hardness 250 mg/L CaCO₃, pH 7.8+/−0.2

log Kₐw: -0.82 – -0.66

Half-life (hr) air: 427

Half-life (hr) H₂O surface water: 5.3 – 64

Henry’s Law constant (atm m³/mol): 4.55X10⁻⁶

BOD 5 if unstated: 0.76 – 1.12

COD: 1.05 – 1.50, 99%

ThOD: 1.05

BCF: 0.2 – 10

TL(m/48 hr): 8000mg/L (trout)

Toxicity Arthropoda: NOEL 10 g/L/48 hr (Daphnia)

HSNO Classification: 9.3C – Harmful to terrestrial vertebrates
Methanol in fresh or salt water may have serious effects on aquatic life. A study on methanol's toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down into carbon dioxide and water.

Environmental Fate:

Biodegradability: Biodegrades easily in water and soil.

Bioaccumulation:

• **TERRESTRIAL FATE:** Based on a classification scheme, an estimated Koc value of 1 determined from a structure estimation method indicates that methanol is expected to have very high mobility in soil. Volatilization of methanol from moist soil surfaces is expected to be an important fate process given a Henry's Law constant of 4.55X10^{-6} (atm m^3/mol). The potential for volatilization of methanol from dry soil surfaces may exist based upon a vapor pressure of 127 mm Hg. Biodegradation is expected to be an important fate process for methanol.

• **AQUATIC FATE:** Based on a classification scheme, an estimated Koc value of 1, determined from a structure estimation method, indicates that methanol is not expected to adsorb to suspended solids and sediment. Volatilization from water surfaces is expected based upon a Henry's Law constant of 4.55X10^{-6} (atm m^3/mol). Using this Henry's Law constant and an estimation method, volatilization half-lives for a model river and model lake are three and 35 days, respectively. According to a classification scheme, a BCF of less than 10 measured in fish, suggests bioconcentration in aquatic organisms is low. Hydrolysis and photolysis in sunlit surface waters is not expected to be an important environmental fate process for methanol since this compound lacks functional groups that hydrolyze or absorb light under environmentally relevant conditions. Methanol has been shown to undergo rapid biodegradation in a variety of screening studies using sewage seed and activated sludge inoculum, which suggests that biodegradation will occur in aquatic environments.

• **ATMOSPHERIC FATE:** According to a model of gas/particle partitioning of semi volatile organic compounds in the atmosphere, methanol, which has a vapor pressure of 127 mm Hg at 25°C, is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase methanol is degraded in the atmosphere by reaction with photo chemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 17 days, calculated from its rate constant of 9.4X10^{-13} cm/cmolecule-sec at 25°C

### 13. Disposal Considerations

Review federal, provincial or state, and local government requirements prior to disposal. Store material for disposal as indicated in Section #7, Handling and Storage. Disposal by controlled incineration or by secure land fill may be acceptable.

Recycle wherever possible. Large volumes may be suitable for re-distillation or, if contaminated, incinerated. Can be disposed of in a sewage treatment facility. Methanol levels of up to 0.1% act as a food source for bacteria; above this level may be toxic to bacteria. When pumping through sewage collection systems, the level of methanol should be kept below the flammable range (a 25% methanol/water mixture is non-flammable at temperatures below 39°C). 1 ppm of methanol is equivalent to 1.5 ppm BOD loading in the sewage plant.

Container disposal:

Empty containers may contain hazardous residue. Return to supplier for reuse if possible. Never weld, cut or grind empty containers. If disposing of containers, ensure they are well rinsed with water, then disposed of at an authorised landfill. After cleaning, all existing labels should be removed.
14. Transport Information

Canada Transportation of Dangerous Goods (TDG): UN 1230, Methanol, Class 3(6.1), P.G. II
Limited Quantity: ≤ 1 litres
ERG Guide Number: 131

United States Department of Transport (49CFR): (Domestic Only)
UN 1230, Methanol, Class 3, P.G. II, (RQ 5000 lbs/2270 kg)
Limited Quantity: ≤ 1 litres
ERG Guide Number: 131

International Air Transport Association (IATA): UN 1230, Methanol, Class 3(6.1), P.G. II
Packaging Instruction (passenger aircraft): 305, 1 litre maximum per package,

International Maritime Organization (IMO): UN 1230, Methanol, Class 3(6.1), P.G.II,
Flash Point = 11°C
EmS No. F-E, S-D
Stowage Category “B”, Clear of living quarters

Marine Pollutant: No

15. Regulatory Information

CANADIAN FEDERAL REGULATIONS:
CEPA, DOMESTIC SUBSTANCES LIST: Listed (Canadian Environmental Protection Act (CEPA) Schedule I)
WHMIS CLASSIFICATION: B2, D1B, D2A, D2B

UNITED STATES REGULATIONS:
40CFR 116-117 (EPA): Hazardous
40CFR 355, Appendices A and B: Subject to Emergency Planning and Notification
40CFR 372 (SARA Title III): Listed
40CFR 302 (CERCLA): Listed

TOXIC SUBSTANCES CONTROL ACT (TSCA): Listed in the inventory.

16. Other Information

References:
2. Patty's Industrial Hygiene and Toxicology, 5th Edition.
5. Forsberg, K., Quick Selection Guide to Chemical Protective Clothing.
6. Nelson, B.K., Teratological assessment of Methanol and Ethanol at high inhalation levels in rats, Fundamental and Applied Toxicology, Volume 5.
7. NIOSH Guide to Chemical Hazards
8. Hazardous Substance Data Base (HSDB).
Original Preparation Date: September 22, 2005

Prepared by: Kel-Ex Agencies Ltd., P.O. Box 52201, Lynnmour RPO, North Vancouver, B.C., Canada, V7J 3V5

Disclaimer: The information above is believed to be accurate and represents the best information currently available to us. Users should make their own investigations to determine the suitability of the information for their particular purposes. This document is intended as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.

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This Material Safety Data Sheet may not be changed, or altered in any way without the expressed knowledge and permission of Methanex Corporation

Revisions: Revised and re-issued in GHS Format September 22, 2008
Attachment 6. Nitric Acid MSDS

1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name**  Nitric acid, Trace Metal Grade  
**Cat No.**  A509-212; A509-500; A509P212; A509P500; A509SK212  
**Synonyms**  Azotic acid; Engraver's acid; Aqua fortis  
**Recommended Use**  Laboratory chemicals  
**Company**  Fisher Scientific One  
**Reagent Lane**  Fair Lawn, NJ 07410  
**Tel:**  (201) 796-7100  
**Emergency Telephone Number**  CHEMTREC®, Inside the USA: 800-424-9300  
**Emergency Telephone Number**  CHEMTREC®, Outside the USA: 001-703-527-3887

2. HAZARDS IDENTIFICATION

**DANGER!**  
**Emergency Overview**  Oxidizer: Contact with combustible/organic material may cause fire. Causes severe burns by all exposure routes. May cause pulmonary edema.  
**Appearance**  Clear Colorless, Light yellow  
**Physical State**  Liquid  
**odor**  strong Acrid

**Target Organs**  Eyes, Respiratory system, Skin, Teeth, Kidney, Gastrointestinal tract (GI)  
**Potential Health Effects**  
**Acute Effects**  
**Principle Routes of Exposure**  
- **Eyes**  Causes severe burns. May cause blindness or permanent eye damage.  
- **Skin**  Causes severe burns. May be harmful in contact with skin.  
- **Inhalation**  Causes severe burns. May cause pulmonary edema. May be harmful if inhaled.  
- **Ingestion**  Ingestion causes burns of the upper digestive and respiratory tract. May be harmful if swallowed.  
**Chronic Effects**  Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are
common. Gastrointestinal disturbances may also be seen. May cause adverse kidney effects. Experiments have shown reproductive toxicity effects on laboratory animals.
See Section 11 for additional Toxicological information.

Aggravated Medical Conditions
Preexisting eye disorders. Skin disorders.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Haz/Non-haz Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>7697-37-2</td>
<td>65 - 70</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>30 - 35</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.

Ingestion
Do not induce vomiting. Call a physician or Poison Control Center immediately.

Notes to Physician
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point
Method
Not applicable
No information available.

Autoignition Temperature
No information available.

Explosion Limits
Upper
No data available

Lower
No data available

Suitable Extinguishing Media
Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media
No information available.

Hazardous Combustion Products
No information available.

Sensitivity to mechanical impact
No information available.

Sensitivity to static discharge
No information available.

Specific Hazards Arising from the Chemical
Oxidizer: Contact with combustible/organic material may cause fire. Corrosive Material. Causes severe burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

NFPA  Health  4  Flammability  0  Instability  0  Physical hazards  OX

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing.

Environmental Precautions
Should not be released into the environment.

Methods for Containment and Clean Up
Soak up with inert absorbent material. Keep in suitable and closed containers for disposal. Keep away from clothing and other combustible materials.

7. HANDLING AND STORAGE

Handling
Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Keep away from clothing and other combustible materials. Do not breathe vapors/dust. Do not ingest. Contents under pressure.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures
Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>TWA: 2 ppm  STEL: 4 ppm</td>
<td>(Vacated) TWA: 2 ppm  TWA: 5 mg/m³  (Vacated) STEL: 4 ppm  TWA: 10 mg/m³</td>
<td>TWA: 2 ppm  TWA: 5 mg/m³  STEL: 4 ppm  TWA: 10 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>TWA: 2 ppm  TWA: 5.2 mg/m³</td>
<td>TWA: 2 ppm  TWA: 5 mg/m³</td>
<td>TWA: 2 ppm  STEL: 4 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 4 ppm  STEL: 10 mg/m³</td>
<td>STEL: 4 ppm  STEL: 10 mg/m³</td>
<td>STEL: 4 ppm</td>
</tr>
</tbody>
</table>
NIOSH IDLH: Immediately Dangerous to Life or Health

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection
Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Clear Colorless, Light yellow</td>
</tr>
<tr>
<td>odor</td>
<td>strong Acrid</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available.</td>
</tr>
<tr>
<td>pH</td>
<td>1.0 (0.1M)</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.94 kPa (20°C)</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No information available.</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>120.5°C / 248.9°F</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-41°C / -41.8°F</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No information available.</td>
</tr>
<tr>
<td>Flash Point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available.</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.40</td>
</tr>
<tr>
<td>Solubility</td>
<td>No information available.</td>
</tr>
<tr>
<td>log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>63.02</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>HNO3</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability
Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid

Incompatible Materials
Strong bases, Reducing agents, Organic materials, Aldehydes, Alcohols, Cyanides, Metals, Powdered metals, Ammonia

Hazardous Decomposition Products
Nitrogen oxides (NOx)

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information
<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>Not listed</td>
<td>Not listed</td>
<td>130 mg/m³ (Rat) 4 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 mg/L (Rat) 1 h</td>
</tr>
</tbody>
</table>

Irritation
Causes severe burns by all exposure routes

Toxicologically Synergistic Products
No information available.

Chronic Toxicity

Carcinogenicity
There are no known carcinogenic chemicals in this product

Sensitization
No information available.

Mutagenic Effects
No information available.

Reproductive Effects
Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects
No information available.

Teratogenicity
Teratogenic effects have occurred in experimental animals.

Other Adverse Effects
See actual entry in RTECS for complete information.

Endocrine Disruptor Information
No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Do not empty into drains.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>Not listed</td>
<td>72 mg/L LC50 96 h</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Persistence and Degradability
No information available

Bioaccumulation/ Accumulation
No information available

Mobility

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>-2.3</td>
</tr>
</tbody>
</table>

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.
14. TRANSPORT INFORMATION

DOT

- UN-No: UN2031
- Proper Shipping Name: NITRIC ACID
- Hazard Class: 8
- Subsidiary Hazard Class: 5.1
- Packing Group: II

TDG

- UN-No: UN2031
- Proper Shipping Name: NITRIC ACID
- Hazard Class: 8
- Subsidiary Hazard Class: 5.1
- Packing Group: II

IATA

- UN-No: UN2031
- Proper Shipping Name: NITRIC ACID
- Hazard Class: 8
- Subsidiary Hazard Class: 5.1
- Packing Group: II

IMDG/IMO

- UN-No: UN2031
- Proper Shipping Name: NITRIC ACID
- Hazard Class: 8
- Subsidiary Hazard Class: 5.1
- Packing Group: II

15. REGULATORY INFORMATION

All of the components in the product are on the following Inventory lists:

<table>
<thead>
<tr>
<th>International Inventories</th>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>CHINA</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nitric acid</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-714-2</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-791-2</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>7697-37-2</td>
<td>65 - 70</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

- Acute Health Hazard: Yes
- Chronic Health Hazard: No
- Fire Hazard: No
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: Yes

Clean Water Act

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>X</td>
<td>1000 lb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clean Air Act

Not applicable

OSHA

<table>
<thead>
<tr>
<th>Component</th>
<th>Specifically Regulated Chemicals</th>
<th>Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>-</td>
<td>TQ: 500 lb</td>
</tr>
</tbody>
</table>

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>1000 lb</td>
<td>1000 lb</td>
</tr>
</tbody>
</table>

California Proposition 65

This product does not contain any Proposition 65 chemicals.

State Right-to-Know

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
</table>

Page 9 / 9
<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product contains the following DHS chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>DHS Chemical Facility Anti-Terrorism Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric acid</td>
<td>2000 lb STQ</td>
</tr>
</tbody>
</table>

**Other International Regulations**

Mexico - Grade
No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**WHMIS Hazard Class**

C Oxidizing materials
E Corrosive material

---

**16. OTHER INFORMATION**

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Tel: (412) 490-8929

Creation Date 12-Mar-2009

Print Date 27-Sep-2011

Revision Summary (M)SDS sections updated 3
Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.