



EXPLANATION OF THE MATERIAL SAFETY DATA SHEET

The information in the Material safety Data Sheet (MSDS) is organized into fifteen sections which are as follows:

I Product Identification	VIII First Aid
II Component Data	IX Toxicology and Health Information
III Precautions for Safe Handling and Storage	X Transportation Information
IV Physical Data	XI Spill and Leak Procedures
V Personal Protective Equipment Requirements	XII Waste Disposal
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Section I — *Product Identification*

The product name and synonyms are used to identify the product. The Olin MSDS number and revision number identify the Material Safety Data Sheet (MSDS) itself. The chemical family or name and synonyms are given with formula where applicable. A brief use description of the product is presented along with the OSHA Hazard Classifications.

Section II — *Component Data*

All Olin products are evaluated to determine if they are hazardous. According to the Occupational Safety and Health Administration (OSHA), a hazardous chemical refers to any chemical may be a physical hazard if it is combustible, flammable, pyrophoric, chemically unstable, water reactive or explosive, a compressed gas, an organic peroxide or other oxidizer.

A chemical may present a health hazard if exposure could result in acute or chronic adverse health effects. This definition of a hazardous material has been adapted from the OSHA Hazardous Communication Standard (29 CFR 1910.1200). The reader should refer to the Standard for further details. If it has been determined that a product is not hazardous, then this is stated. If it has been determined that the product is a health hazard then all components that present a health hazard and that comprise 1% or more of the material are listed in this section. Also, any component that is a carcinogen is listed if it comprises 0.1% or more of the product. If it has been determined that the product is a physical hazard, then any component that presents a physical hazard is listed.

Normally, the chemical name and Chemical Abstracts Service (CAS) Number are used to identify a component. CAS numbers are assigned to chemicals and mixtures by the Chemical Abstracts Service (published by the American Chemical Society) as a specific identification. Where the identity of a component is a trade secret, a descriptive name is used instead of the chemical name and a trade secret access number is given to that component. Disclosure of the identity of the trade secret component will be made to health professionals upon request, subject to the conditions specified in the Standard.

Exposure limits are given for each component where these have been established. Definitions of these exposure limits follow:

- **ACGIH TLV (Threshold Limit Value):** A term used by the American Conference of Governmental Industrial Hygienists to express the

airborne concentration of a material to which nearly all persons can be exposed day after day without adverse effects. ACGIH expresses TLV's in three ways:

- **TLV-TWA:** = The allowable Time Weighted Average concentration for a normal 8-hour workday of a 40-hour workweek.
- **TLV-STEL:** = The Short-Term Exposure Limit, or maximum concentration for a continuous 15-minute exposure period. A maximum of four such periods per day, with at least 60 minutes between exposure periods are allowed, provided that the daily TLV is not exceeded.
- **TLV-C:** The Ceiling exposure limit; the concentration that should not be exceeded even instantaneously.
- **SKIN:** A notation used to indicate that the stated substance may be absorbed by the skin, mucous membranes and eyes, either by air or direct contact, and that this additional exposure must be considered part of the total exposure to avoid exceeding TLV for that substance.

The value quoted is the TWA unless another category is stated.

- **OSHA PEL (Permissible Exposure Limits):** An exposure limit established by the Occupational Safety and Health Administration. May be a time weighted average (TWA) limit or ceiling (C) exposure limit. A skin notation has the same meaning as for the TLV.

Section III — *Precautions for Safe Handling and Storage*

This section provides vital information for handling and storing a product. It is important that all recommendations be followed

Section IV — *Physical Data*

Knowledge of the physical properties of a substance is necessary for all safety and industrial hygiene decisions. Definitions of terms that apply to the physical data presented in this section are given below:

- **Freezing Point/Melting Point:** The temperature at which a substance changes state from liquid to solid or solid to liquid. For mixtures, a range may be given.
- **Boiling Point:** The temperature at which a liquid changes to a vapor state at a given pressure. (Usually 760 mmHg, or one atmosphere.) For mixtures, the initial boiling point or the boiling range may be given. Flammable materials with low boiling points generally present special fire hazards.
- **Decomposition Temp:** The temperature at which a substance will break down, or decompose, into smaller fragments.

- **Specific Gravity:** The weight of a material compared to the weight of an equal volume of water; an expression of the density (or heaviness) of the material. Example: if a volume of material weighs 8 pounds, and an equal volume of water weighs 10 pounds, the material has a specific gravity of 0.8:

$$\frac{8 \text{ lbs}}{10 \text{ lbs}} = 0.8$$

Insoluble materials with a specific gravity of less than 1.0 may float in (or on) water. Insoluble materials with a specific gravity greater than 1.0 may sink in water. Most insoluble flammable liquids having a specific gravity of less than 1.0 will float on water, an important consideration for fire suppression.

- **Bulk Density:** Weight of material per unit volume.
- **pH:** A value presenting the acidity or alkalinity of an aqueous solution.

1	7	14
Acidic	Neutral	Alkaline
- **Vapor Pressure:** The pressure (usually expressed in millimeters of mercury) characteristic at any given temperature of a vapor in equilibrium with its liquid or solid form.
- **Solubility in Water:** A term expressing the percentage of a material (by weight) that will dissolve in water at ambient temperature. Solubility information may be useful in determining spill cleanup methods and fire-extinguisher agents.
- **Volatiles, Percent by Volume:** The percentage of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70°F (unless some other temperature is stated).
- **Evaporation Rate:** The rate at which a particular material will vaporize (evaporate) when compared to the rate of vaporization of a known material. The evaporation rate can be useful in evaluating the health and fire hazards of a material. The known material is usually either normal butyl acetate or water, with a vaporization rate as 1.0.
- **Vapor Density (Air = 1):** A relative comparison of the density of the vapor compared to the density of air (Air = 1). If the vapor density is greater than 1, then the vapor is heavier than air.
- **Molecular Weight:** The molecular weight of a chemical is the sum of the atomic weights of the atoms making up one molecule of the chemical.
- **Coefficient of Oil/Water Distribution:** If a substance which is soluble both in oil and in water is added to a two-phase oil/water system, then the ratio of the concentration of that substance in oil to its concentration in water is called the Coefficient of Oil/Water distribution.

Section V — Personal Protective Equipment Requirements

The proper use of personal protective equipment is of the utmost importance, and the guidelines presented in this section must be closely followed. Descriptions of specific equipment (goggles, gloves, respirators, etc.) required for routine use are given. Use of additional protective

equipment, as required for fire-fighting and for spill and leak cleanup, is outlined in Section XI.

Use of some products may require specific ventilation requirements. The following definitions apply to ventilation systems.

- **General Exhaust:** A system for exhausting air containing contaminants from a general work area. General exhaust may be referred to as dilution ventilation.
- **Local Exhaust:** A system for capturing and exhausting contaminants from the air at the point where the contaminants are produced (welding, grinding, sanding, other processes or operations).

Section VI — Fire and Explosion Hazard Information

The recommended extinguishing media to be used in the event of a fire are given, together with any unusual fire and explosion hazards.

The terms that follow are defined in 29 CFR 1910.1200(c) which should be consulted for the complete text. Note that some of these same terms have different definitions for transportation information. A shortened form of the definitions follow:

- **Explosive:** A chemical that causes an almost instantaneous release of gas and heat when subjected to certain conditions.
- **Pyrophoric:** A substance that burns spontaneously in air at a temperature of 130°F or below.
- **Flammable:** There are four classes of flammable chemicals as follows:
 - An aerosol flammable is an aerosol which yields a flame projection exceeding 18 inches or a flashback under certain test conditions.
 - A flammable gas forms a flammable mixture with air at a concentration of 13% or less or forms a flammable mixture with air wider than 12% by volume.
 - A flammable liquid is any liquid having a flash point below 100° F (37.8°C), with the exception of mixtures in which 99% of the components have flash points of 100°F or higher.
 - A flammable solid is a solid (with certain exceptions) that is liable to cause fire through friction, absorption of water or other reasons, or which can be ignited readily and when ignited burns in such a manner as to create a serious hazard.
- **Combustible:** A combustible liquid is any liquid having a flash point at or above 100°F (37.8°C), but below 200°F (93.3°C), with the exception of mixtures in which 99% of the components have flash points of 200°F or higher.

- **Flash Point:** The temperature at which a liquid will give off enough flammable vapor to ignite in the presence of an ignition source.

There are several flash point test methods. Because flash points may vary for the same material depending on the method used, the test method is indicated when the flash point is given. The methods most frequently quoted are:

- PMCC: Pinsky -Martens Closed Cup—ASTM D93
- SETA: Setaflash Closed Cup—ASTM D3278
- TCC: Tag (Tagliabue) Closed Cup—ASTM D56

Details of these methods can be found in Section V of the Annual Book of ASTM Standards.

- **Autoignition Temperature:** The lowest temperature at which a liquid will give off enough flammable vapors and heat energy to ignite spontaneously and maintain combustion.
- **UEL and LEL:** Upper Explosive Limit and Lower Explosive Limit are the highest concentration and lowest concentration respectively that will produce a flash of fire when an ignition source is present. At higher concentrations than the UEL, the mixture is too “rich” to burn. At concentrations lower than the LEL, the mixture is too “lean” to burn.
- **NFPA Ratings:** The National Fire Protection Association Standard System for the Identification of the Fire Hazards of Materials—NFPA No 704.

The NFPA ratings provide a general idea both of the hazards and of the degree of the hazards associated with a material relative to fire protection and control. The Standard addresses the hazards under the three categories of “Health,” “Flammability,” and “Reactivity” and assigns numeric ratings using a scale of 0 to 4 with 0 indicating no particular hazard, and 4 the most hazardous. It should be noted that health hazard ratings refer specifically to short-term exposure under fire conditions. The Standard also makes provision for special hazard warnings, such as water reactivity. For further details see ‘Fire Protection Guide on Hazardous Materials’ — National Fire Protection Association, Quincy, MA.

- **HMIS Ratings:** The Hazard Materials Identification System of the National Paint and Coatings Association.

The system is similar to the NFPA Standard in utilizing a 0-4 scale, rating the degree of hazard under the same three categories of health, flammability and reactivity, with 0 being the least hazardous and 4 the most. It should be noted that unlike NFPA ratings, HMIS ratings are not intended for emergency situations. The flammability and reactivity ratings will, however, usually be the same as the NFPA ratings. The health hazard rating is based on the acute toxicity of the chemical. For further information on these ratings, see ‘HMIS Rating Manual’—National Paint and Coatings Association, Washington, DC.

Section VII — Reactivity Information

A substance is said to be reactive if it readily enters into chemical reactions and undergoes chemical change. For MSDS purposes the reactions can be grouped into three broad categories:

- (a) Decomposition: The chemical breakdown of a material into parts or simpler compounds.
- (b) Polymerization: A chemical reaction in which small molecules combine to form larger molecules.
- (c) Reactions with other chemicals: Any other chemical reaction.

- **Decomposition—Stable/Unstable.**

A substance is stable if it is resistant to decomposition or possesses the ability to remain unchanged. For MSDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of use. A substance is considered unstable if it tends to suffer decomposition under these conditions. Some materials may become unstable at higher temperatures. Whenever relevant, the temperature at which a material can be said to be unstable is stated. Other conditions that may cause instability, such as shock from dropping or static electricity, are noted when applicable.

- **(b) Polymerization—Hazardous Polymerization.**

A polymerization reaction is hazardous when it takes place at a rate that releases large amounts of energy. If hazardous polymerization can occur with a given material, the MSDS usually will list conditions that could start the reaction. In addition, since the material usually contains a polymerization inhibitor, the expected time period before the inhibitor is used up is also given.

- **(c) Reactions with Other Chemicals—Incompatible Materials.**

Materials that could cause dangerous reactions from direct contact with one another are described as incompatible. Common chemicals that react with the product are usually listed in the MSDS. Hazardous products of decomposition, including combustion products, are listed.

Section VIII — First Aid

First aid procedures are described for each of the normal routes of exposure. It is important that first aid be administered as soon as possible after exposure has occurred. If in any doubt regarding the victim's condition, a physician should be called. In case of emergency call Olin's OCEAN Network 1-888-2891-911. OCEAN, which stands for Olin Corporation Emergency Action Network, is accessible 24 hours a day.

Section IX — Toxicology and Health Information

The consequences of exposure, if any, by inhalation, skin or eye contact, or ingestion are outlined in this section. The signs, symptoms and effects that the exposure could produce are described so that any exposure would be recognized as quickly as possible and the appropriate action taken. The organs that are more susceptible to attack are referred to as target organs. The effects and damage that exposure could produce on these organs are given together with the symptoms. Some of the terms used that may be less familiar or which may have a specific inference in MSDS's are defined below:

- **Acute Effect:** An adverse effect on a human or animal body resulting from a single exposure with symptoms developing almost immediately or shortly after exposure. The effect is usually of short duration.
- **Chronic Effect:** An adverse effect on a human or animal body resulting from repeated low level exposure, with symptoms that develop slowly over a long period of time or that recur frequently.
- **Corrosive:** A liquid or solid that causes visible destruction or irreversible alterations in human or animal tissue.
- **Irritation:** An inflammatory response or reaction of the eye, skin, or respiratory system.
- **Allergic Sensitization:** A process whereby on first exposure a substance causes little or no reaction in humans or test animals, but which on repeated exposure may cause a marked response not necessarily limited to the contact site. Skin sensitization is the most common form of sensitization in the industrial setting, although respiratory sensitization is also known to occur.
- **Teratogen:** A substance or agent to which exposure of a pregnant female can result in malformations to the skeleton and or soft tissue of the fetus.

■ **Mutagen:** A substance or agent capable of altering the genetic material in a living organism.

■ **Carcinogen:** A substance or agent capable of causing or producing cancer in humans or animals. Authorities/organizations that have evaluated whether or not a substance is a carcinogen are the International Agency for Research on Cancer (IARC), the U.S. National Toxicology Program (NTP), and OSHA.

To evaluate the potential human effects from exposure to hazardous chemicals, studies in laboratory animals are performed. The terms most commonly used to define the results of the studies: are as follows:

- **LD₅₀ (Lethal Dose Fifty)** — The dose of a substance expected to cause the death of 50% of an experimental animal population. This dose may be from oral, dermal, or other routes of exposure. The units given for the LD₅₀ are usually milligrams per kilogram body weight of the tested animal (mg/kg).
- **LC₅₀ (Lethal Concentration Fifty)** — A calculated concentration of a substance in air, exposure to which for a specified length of time is expected to cause the death of 50% of a laboratory animal population. This concentration is usually in units of milligrams per cubic meter of air (mg/m³) or milligrams per liter of air (mg/l) and is given for some time period (usually one or four hours).

Other terms occasionally used are:

- **LD_{LO} (Lethal Dose Low)** — The lowest dose of a substance introduced by any route other than inhalation reported to have caused death in humans or animals.
- **LC_{LO} (Lethal Concentration Low)** — The lowest concentration of a substance in air that has been reported to have caused death in humans or animals.
- **TD_{LO} (Toxic Dose Low)** — The lowest dose of a substance to which humans or animals have been exposed and reported to produce a toxic effect other than cancer.

Based on these values, an estimate of human health effects potential is obtained.

Section X — Transportation Information

In the event the material is regulated as hazardous by the Department of Transportation (DOT), the Hazardous Materials Regulations as described in the Code of Federal Regulations, 49 Chapter 1 subchapter C are outlined in the LAND portion of Section X. The IMO and IATA/ICAO regulations are also given for water and air modes respectively.

Section XI — Spill and Leak Procedures

In the event of an emergency, CHEMTREC (Chemical Transportation Emergency Center) should be contacted.

CHEMTREC is a national center established by the Chemical Manufacturer Association (CMA) in Washington, DC, to relay pertinent emergency information concerning specific chemicals on request. CHEMTREC has a 24-hour toll-free telephone number (800) 424-9300, intended primarily for use by those who respond to chemical transportation emergencies.

During cleanup of spills or leaks, it may be necessary to use extra personal protective equipment as compared to normal operations. Recommendations for equipment use additional to what is described in Section V are given.

Procedural recommendations relative to air, land and water are described.

Section XII — Waste Disposal

This section gives guidelines for disposing of a product if it becomes a waste. Recommendations are based upon the physical state and hazardous properties of the material. If the material is designated as hazardous by 40 CFR Part 261, it must be disposed of in a permitted hazardous waste treatment, storage, or disposal facility in accordance with local, state, and federal regulations. If the material is non-hazardous, recommendations for disposal are made depending on the physical state and known characteristics of the material.

Section XIII — Additional Regulatory Information

This section contains information relevant to compliance with other Federal and/or state laws such as TSCA, FIFRA and FDA.

Section XIV — Additional Information

Any relevant additional information is given in this section.

Section XV — Major References

This section lists some of the major references that have been consulted in preparing the Material Safety Data Sheet.