

Always review the chemical safety information, including the Material Safety Data Sheet (MSDS) before starting to work with any new or unfamiliar cleaning product or chemical.

Introduction

Material Safety Data Sheets (MSDS) provide information about precautions for protecting against known hazards associated with the material and often include useful information on chemical, physical, and toxicological and ecological properties, along with suggestions for storing, transporting, and disposing of chemicals. MSD Sheets are a general source of information, and they should be consulted as a first step in assessing the risk associated with using a product or chemical. However, because there is currently no mandated standard format for MSD Sheets, their quality varies widely depending upon manufacturer, and the information that they contain may be inappropriate for all applications. Exercise caution, and utilize non-MSDS sources of information as well (see list at end of Glossary of Terms below). Never use a chemical product if there is doubt about how to handle or use it. You should always consult with your Environmental, Health and Safety (EH&S) professionals if you have environmental, health or safety questions. Consult with your supplier when you have application questions.

Below is a glossary of terms associated with Material Safety Data Sheets (MSDS). The glossary has been prepared to help define words, acronyms and technical terms that you may find on MSD Sheets.

Glossary of MSDS Terms

A

action level - exposure level at which OSHA regulations take effect. This is generally one-half of the PEL.

acute effect - involves severe symptoms which develop rapidly and may quickly reach a crisis.

acute exposure - a short-term exposure usually occurring at high concentration.

acute hazard - a single exposure that may cause harm, but which is unlikely to lead to permanent damage.

acute health effect - an effect that develops either immediately or a short time after exposure.

Allergic Contact Dermatitis - type of skin hypersensitivity. Its onset may be delayed by several days to as much as several years, for weaker sensitizers. Once sensitized, fresh exposure to the sensitizing material can trigger itching and dermatitis within a few hours.

Ames Test - used to assess whether a chemical might be a carcinogen. It assumes that carcinogens possess mutagenic activity, and uses bacteria and mammalian microsomes to determine whether a chemical is a mutagen. Approximately 85% of known carcinogens are mutagens. The Ames test, therefore, is a helpful but not perfect predictor of carcinogenic potential.

Argyria or **Argyria** - an irreversible bluish-black discoloration of the skin, mucous membranes or internal organs caused by ingestion of, or contact with, various silver compounds.

auto-ignition temperature (of a chemical) - the lowest temperature at which the material will ignite without an external source of ignition.

B

breakthrough time - the time taken in standard tests for permeation of a chemical through a protective barrier (such as a rubber glove) to be detected.

boiling point - the temperature at which a liquid changes from a liquid to a gas, at normal atmospheric pressure.

C

carcinogen - chemical known or believed to cause cancer in humans. The number of known carcinogens is comparatively small, but many more chemicals are suspected to be carcinogenic.

CAS Registry number - a unique, identifying number assigned to a chemical by the Chemical Abstracts Service (CAS).

chemical formula - sometimes called the molecular formula, indicates the elements that make up a chemical.

chemical name - a proper scientific name for the active ingredient of a product.

chronic exposure - a long-term exposure, usually occurring at low concentrations.

chronic hazard - chemical which has the potential to cause long-term damage to health, often as a consequence of repeated or prolonged exposure to it.

chronic health effect - an effect that appears a long time after exposure.

Chrysiasis - development of a blue-gray pigmentation in skin and mucous membranes. May be caused by exposure to gold compounds.

coefficient of oil/water distribution - the ratio of the solubility of the chemical in an oil to its solubility in water.

combustible liquid - a liquid which has a flash point above 37.8 C (100° F).

compressed gas - a material which is a gas at normal room temperature (20° C) and pressure but is packaged as a pressurized gas, dissolved gas or gas liquefied by compression or refrigeration.

condensation - the process of reducing from one form to another denser form such as steam to water.

corrosive material - a material that can attack (*corrode*) metals or cause permanent damage to human tissues such as skin and eyes on contact.

COSHH (Control of Substances Hazardous to Health) - COSHH regulations impose a number of obligations on employers; the object of the regulations is to promote safe working with potentially hazardous chemicals.

cryogenics - materials which exist at extremely low temperatures, such as liquid nitrogen.

cutaneous hazard - a chemical which may cause harm to the skin, such as defatting, irritation, skin rashes or dermatitis.

D

degradation - term generally used to describe the loss of resilience of material used for protective gloves. Degradation may cause the material to soften, swell, become hard and brittle, or - in severe cases - disintegrate.

density - the weight of a material in a given volume. It is usually given in grams per milliliter (*g/ml*).

dilution ventilation - dilution of contaminated air with uncontaminated air in a general area, room or building for the purposes of health hazard or nuisance control, and/or for heating and cooling.

dose - amount of the agent that has entered the body through the various routes of entry.

D.O.T. - Common abbreviation for the U.S. Department of Transportation, which regulates the transport of chemicals in the U.S.A.

DOT hazard codes

1	Explosives	5.1	Oxidizer
2.1	Flammable gas	5.2	Organic peroxide
2.2	Non-flammable gas	6.1	Poison-keep away from food
2.3	Poisonous gas	6.2	Infectious material
3	Flammable liquid	7	Radioactive
4.1	Flammable solid	8	Corrosive
4.2	Spontaneously combustible	9	Miscellaneous
4.3	Dangerous when wet		

E

ED50 (Effective Dose 50) - the amount of material required to produce a specified effect in 50% of an animal population. (See qualification in the definition of LD50).

EINECS - acronym for European Inventory of Existing Commercial Chemical Substances. **ELINCS** - acronym for European List of Notified Chemical Substances.

embryotoxins retard the growth or affect the development of the unborn child. In serious cases they can cause deformities or death. Mercury compounds and certain heavy metals, aflatoxin, formamide and radiation are known embryotoxins.

etiologic agents - microscopic organisms such as bacteria or viruses, which can cause disease.

evaporation rate - the rate at which a liquid changes to vapor at normal room temperature.

explosive (flammable) limits - the lower explosive (*flammable*) limit (*LEL*) is the lowest concentration of vapor in air which will burn or explode upon contact with a source of ignition. The upper explosive (*flammable*) limit (*UEL*) is the highest concentration of vapor in air which will burn or explode upon contact with a source of ignition.

explosive (flammable) range - the range between the lower explosive limit (*LEL*) and the upper explosive limit (*UEL*).

exposure limits- established concentrations which, if not exceeded, will not generally cause adverse effects to the worker exposed. Exposure limits differ in name and meaning depending on origin. For example: **Permissible Exposure Levels** are legally enforceable exposure limits, set by OSHA. PELs are not available for all chemicals. Different exposure limits include:

TWA *Time-WeightedAverage*: The average airborne concentration of a biological or chemical agent to which a worker may be exposed in a workday or a work - week.

STEL *Short Term Exposure Level*: - The maximum airborne concentration of a chemical or biological agent to which a worker may be exposed in any 15 minute period, provided the TWAEV is not exceeded.

CEILING *Ceiling Exposure Level*: The maximum airborne concentration of a biological or chemical agent to which a worker may be exposed at any time.

SKIN: This notation indicates that direct or airborne contact with the product may result in significant absorption of the product through the skin, mucous membranes or eyes. Inclusion of this notation is intended to suggest that preventative action be taken against absorption of the agent through these routes of entry.

Threshold Limit Values (*TL Vs*) are exposure guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH). They are not legally enforceable, but because they are updated regularly, they represent good professional practice. They are expressed as follows:

TLV-TWA *Threshold Limit Value - Time-WeightedAverage*: The time-weighted average concentration for a normal 8 hour work day and a 40 hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

TLV-STEL *Threshold Limit Value - Short Term Exposure Limit* 15 minute time-weighted average exposure which should not be exceeded at any time during a work day even if the 8 hr TWA is within the TLV. Exposures at the STEL should not be repeated more than 4 times a day and there should be at least 60 minutes between successive exposures at the STEL.

TLV-C *Threshold Limit Value - Ceiling*: the concentration that should not be exceeded during any part of the working exposure.
Other exposure limits include the Permissible Exposure Limits (*PEL*) which are legal exposure limits in the United States.

F

f/cc - fibers per cubic centimeter of air. **FDA** - U.S. Food and Drug Administration.

flammable limits - "See Explosive Limits".

flashback - occurs when the flame in a gas torch burns back into the torch or hose; this is often accompanied by a hissing or squealing sound, and a pointed or smoky flame.

flash point of a chemical is the lowest temperature at which a flame will propagate through the vapor of a combustible material to the liquid surface. It is determined by the vapor pressure of the liquid, since only when a sufficiently high vapor concentration is reached, can it support combustion. It should be noted that the source of ignition need not be an open flame, but could equally be, for example, the surface of a hot plate, or a steam pipe.

freezing point - the temperature at which a liquid becomes a solid, at normal atmospheric pressure.

H

hazard- the potential for harmful effects. **hazard codes** - see UN hazard codes.

hazardous decomposition products - formed when a material decomposes (*breaks down*) because it is unstable, or reacts with materials such as water or oxygen in air.

hazardous polymerization - Polymerization is a process of forming a polymer by combining large numbers of chemical units or monomers into long chains (*polyethylene from ethylene or polystyrene from styrene*). Uncontrolled polymerization can be extremely hazardous. Some polymerization processes can release considerable heat or can be explosive.

hematopoietic agent - chemical which interferes with the blood system by decreasing the oxygen-carrying ability of hemoglobin. This can lead to cyanosis and unconsciousness. Carbon monoxide is one such agent, familiar to smokers.

hepatotoxin - chemical capable of causing liver damage.

hypoxia - a condition defined by a low supply of oxygen.

I

inhibitor - material which is added to a chemical to prevent an unwanted reaction. For example, BHT (2,6-di-t-butyl-p-cresol) is often added to tetrahydrofuran to prevent potentially dangerous polymerization.

ingestion - means taking a material into the body by mouth (*swallowing*).

inhalation - means taking a material into the body by breathing it in.

IARC - International Agency for Research in Cancer. The IARC home page is at <http://www.iarc.fr/>

irritant - chemical which may cause reversible inflammation on contact.

L

LC50 (Lethal Concentration 50) - the concentration of a chemical which kills 50% of a sample population. This measure is generally used when exposure to a chemical is through the animal breathing it in, while the LD50 is the measure generally used when exposure is by swallowing, through skin contact, or by injection. (See also LD50).

LD50 (Lethal Dose 50) - the dose of a chemical which kills 50% of a sample population. In full reporting, the dose, treatment and observation period should be given. Further, LD50, LC50, ED50 and similar figures are strictly only comparable when the age, sex and nutritional state of the animals is specified. Nevertheless, such values are widely reported and used as an effective measure of the potential toxicity of chemicals. (See also LC50).

LDLO - Lethal Dose Low

LEL (Lower Explosive Limit) - See "Explosive Limits".

local exhaust ventilation - involves the capture of pollutants at the source.

M

median lethal dose (MDL) - see LD50.

MEL (Maximum Exposure Limit) - the maximum permitted concentration of a chemical to which a worker may be exposed over an extended period of time. Typically, MELs are quoted in ppm for an 8-hour reference period, though shorter periods may be quoted for some materials. MELs are, in many countries, enforceable by law.

melting point - the temperature at which a solid material becomes a liquid.

MSDS - a widely used abbreviation for Material Safety Data Sheet, which contains details of the hazards associated with a chemical, and gives information on its safe use.

mutagen - an agent that changes the hereditary genetic material which is a part of every living cell. Such a mutation is probably an early step in the sequence of events that ultimately leads to the development of cancer.

N

NA Number - See "UN number".

NIOSH (National Institute for Occupational Safety and Health)- sets OELs and provides services in occupational health and safety investigations in the USA. The NIOSH home page is at <http://www.cdc.gov/niosh/>

nephrotoxin - a chemical which may cause kidney damage. Common examples include antimony compounds, dimethyl sulphoxide, dimethylformamide and tetrahydrofuran.

neurotoxin - chemical whose primary action is on the CNS (Central Nervous System). Many neurotoxins, such as some mercury compounds, are highly toxic, and must only be used under carefully controlled conditions.

nuisance material is one which can cause transient irritation or discomfort, but which has no long-term or systemic effects.

O

OEL (Occupational Exposure Limit) - A (generally legally-enforceable) limit on the amount or concentration of a chemical to which workers may be exposed.

odor threshold - the lowest airborne concentration, usually in part per million, of a vapor in air which can be detected by smell.

OES - Occupational Exposure Standard

oxidizing material - gives up oxygen easily or can readily oxidize other materials.

P

PEL (Permissible Exposure Limit) - a time-weighted average (TWA) or absolute value (usually prescribed by regulation) setting out the maximum permitted exposure to a hazardous chemical.

peroxidizable materials can form peroxides in storage, generally when in contact with the air. These peroxides present their most serious risk when the peroxide-contaminated material is heated or distilled, but they may also be sensitive to mechanical shock. The quantity of peroxides in a sample may be determined using a simple peroxide test strip.

pH - a measure of the acidity or basicity (*alkalinity*) of a material when dissolved in water.

Photoallergic Contact Dermatitis - a skin condition brought on by exposure to light following skin contact with certain types of chemicals, such as sulphonamides.

Pictographs - widely-used pictorial representations of the hazards presented by chemicals.

Poison Class A or B - classified by the DOT into two classes. Those in Class A are highly toxic materials which, even in very small quantities, present a hazard to life. Examples of such gases are cyanogen, phosgene and hydrocyanic acid. Class B poisons, though less toxic, are presumed to present a serious threat to health during transportation.

polymer - a natural or man-made material formed by combining units, called monomers, into long chains.

polymerization - a process of forming a polymer by combining large numbers of chemical units or monomers into long chains.

PPB (Parts Per Billion) - used to specify the concentration (by volume) of a gas or vapor at very low concentration, or a dissolved material at high dilution.

PPM (Parts Per Million) - used to specify the concentration (by volume) of a gas or vapor at low concentration, or a dissolved material at high dilution.

pyrophoric materials ignite spontaneously in air. Since a wide variety of chemicals will burn if heated sufficiently, it is usual to define a pyrophoric material as one which will ignite spontaneously at temperatures below about 45 C.

R

reactive materials - materials that may undergo vigorous condensation, decomposition or polymerization. They may react violently under conditions of shock or increase in pressure or temperature. They may also react vigorously with water or water vapour to release a toxic gas.

reproductive toxin - (such as vinyl chloride or PCBs) - a chemical which may cause birth defects or sterility.

RTECS number - A substance's identification number set by the US Registry of Toxic Effects of Chemical Substances. For further information, connect to the RTECS home page at <http://www.cdc.gov/niosh/rtecs.html>

S

sensitization - the development, over time, of an allergic reaction to a chemical.

sensitizer - a chemical which may lead to the development of allergic reactions after repeated exposure.

solubility - the ability of a material to dissolve in water or another liquid.

solvent - a material which is capable of dissolving another chemical.

specific gravity - the density of a liquid compared to the density of an equal amount of water.

stability - ability of a material to remain unchanged in the presence of heat, moisture or air.

STEL (Short Term Exposure Limit) - the maximum permissible concentration of a material, generally expressed in ppm in air, for a defined short period of time (typically 5 minutes). These values, which may differ from country to country, are often backed up by regulation and therefore may be legally enforceable.

systemic poisons have an effect which is remote from the site of entry into the body.

T

TD50 - TD50 may be defined as follows: for a given target site(s), if there are no tumors in control animals, then TD50 is that chronic dose-rate in mg/kg body wt/day which would induce tumors in half the test animals at the end of a standard lifespan for the species. Since the tumor(s) of interest often does occur in control animals, TD50 is more precisely defined as: that dose-rate in mg/kg body wt/day which, if administered chronically for the standard lifespan of the species, will halve the probability of remaining tumor less throughout that period. A TD50 can be computed for any particular type of neoplasm, for any particular tissue, or for any combination of these. The range of statistically significant TD50 values for chemicals in the CPDB that are carcinogenic in rodents is more than 10 million-fold.

teratogen - chemical which may cause genetic mutations or malformations in the developing fetus. Agents or compounds that a pregnant woman takes into her body that generate defects in the fetus.

TLV (Threshold Limit Value) - the maximum permissible concentration of a material, generally expressed in parts per million in air for some defined period of time (often 8 hours). These values, which may differ from country to country, are often backed up by regulation and therefore may be legally enforceable. See "Exposure Limits".

TLV-C (ceiling exposure limit) - an exposure limit which should not be exceeded under any circumstances.

toxicity - ability of a substance to cause harmful effects.

trade name - the name under which a product is commercially known.

TSCA (Toxic Substances Control Act) - regulates the manufacture, transport and use of toxic substances in the USA.

TWA (Time Weighted Average) - term used in the specification of Occupational Exposure Limits (OELs) to define the average concentration of a chemical to which it is permissible to expose a worker over a period of time, typically 8 hours. See "Exposure Limits"

U

UEL (Upper Explosive Limits) - See "Explosive Limits".

UN Hazard codes

Class 1	Explosive
Class 2	Gases
Class 3.1	Flammable liquids, flash point below -1 8C
Class 3.2	Flammable liquids, flash point between -18C and 23C
Class 3.3	Flammable liquids, flash point between 23C and 61C
Class 4.1	Flammable solids
Class 5.1	Oxidizing agents
Class 5.2	Organic peroxides
Class 6.1	Poisonous substances
Class 7	Radioactive substances
Class 8	Corrosive substances
Class 9	Miscellaneous dangerous substances
NR	Non-regulated

UN Number - a four-digit number assigned to a potentially hazardous material or class of materials. UN (*United Nations*) numbers are internationally recognized and are used by fire fighter and other emergency response personnel for identification of materials during transportation emergencies. NA (*North American*) numbers are assigned by Transport Canada and the US Department of Transport to materials they consider hazardous and to which a UN number has not been assigned.

V

vapor - a gaseous form of a material which is normally solid or liquid at room temperature and pressure.

vapor density - the density of a vapor compared to the density of an equal amount of air.

vapor pressure - the pressure of a vapor in equilibrium with its liquid or solid form.

ventilation - the movement of air.

vesicant - a chemical which, if it can escape from the vein, causes extensive tissue damage, with vesicle formation or blistering.

VOCs -Volatile Organic Compounds.

volatility - the ability of a material to evaporate.

List of Sources to Help Identify Hazards of Chemicals

EPA FACT Sheets

www.epa.gov/enviro/html/emci/chemref/index.html

ASTDR ToxFAQs

www.atsdr.cdc.gov/toxfaq.html

EPCRA Overview

http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/ehs_2003.htm?openDocument

Integrated RISK Information System

www.epa.gov/IRIS/

Workplace Hazardous Materials Information System (WHMIS)

www.hc-sc.gc.ca/hecs-sesc/whmis/index.htm

Occupational Health and Safety Administration (OSHA)

www.osha.gov