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## NWOWS OH&S Book: Part 3: How to use MSDS and work Safely

MSDS sheets are a preventative tool, combined with your Health and Safety Training, and SWPP guidelines working at NWO Well Services will be safer and healthier. Your supervisor will train you in the use of MSDS sheets, as well as give you a 1 on 1 walk through of every part and function of all drill equipment, their safe use, and all hazards, everyday- until you show a complete grasp of all concepts. Additionally they will continuously point out the safe means by which to do all tasks during your time at NWO Well Services.

Employees who fail to grasp the seriousness of Occupational Health and Safety, the hazards of our work sites and equipment, or how to work safely will be let go within 3 months. They will receive 2 written warnings before that time, which will outline what they did wrong, and how to improve. If, after the second warning the employees still fails to grasp the necessary OH&S concepts he or she will be let go.

After 3 months of employment, employees will be disciplined under the guidelines of the discipline section of the SWPP.

### How to read MSDS Sheets

Identify the product. Most MSDS sheets begin with a product name and a chemical name. Look to distinguishing characteristics of the product, so as to confirm that you have the correct MSDS sheet.

When you are sure that you have the correct sheet, look for the most important information. The MSDS should explain what makes the substance dangerous. This should include possible dangers and how to deal with them if you get in such a situation. You will also find first aid instructions. In order to avoid such problematic situations, you are taught in the next two parts about the storage recommendations and how to avoid these problems. You need to keep them at a precise temperature, probably avoid the sunlight and so on. In order to avoid problems, some substances are forbidden from eye contact, while others are forbidden from ingestion.

Take note of safety issues. This portion of the data sheet outlines the protective measures necessary, as well as first-aid procedures and other precautions.

Make sure your supervisor is compliant. The last pieces of the MSDS contain the substance's manufacturer and possibly an emergency phone number. Address any and all questions to your supervisor BEFORE handling the product,

### Common Terms Found in MSDS Sheets

#### ACGIH

ACGIH stands for American Conference of Governmental Industrial Hygienists.

The ACGIH is an association of occupational health professionals employed by government and educational institutions. The Threshold Limit Value (TLV) Committee and Ventilation Committee of the ACGIH publish

guidelines which are used worldwide.

### **ACID, ACIDIC**

See pH.

### **ACTIVE INGREDIENT**

An active ingredient is the part of a product which actually does what the product is designed to do. It is not necessarily the largest or most hazardous part of the product. For example, an insecticidal spray may contain less than 1% pyrethrin, the ingredient which actually kills insects. The remaining ingredients are often called inert ingredients.

### **ACUTE**

Acute means sudden or brief. Acute can be used to describe either an exposure or a health effect. An acute exposure is a short-term exposure. Short-term means lasting for minutes, hours or days. An acute health effect is an effect that develops either immediately or a short time after an exposure. Acute health effects may appear minutes, hours or even days after an exposure. (See also Chronic.)

### **AEROSOL**

An aerosol is a collection of very small particles suspended in air. The particles can be liquid (mist) or solid (dust or fume). The term aerosol is also commonly used for a pressurized container (aerosol can) which is designed to release a fine spray of a material such as paint.

Inhalation of aerosols is a common route of exposure to many chemicals. Also, aerosols may be fire hazards.

### **AIHA**

AIHA stands for American Industrial Hygiene Association.

### **ALKALI, ALKALINE**

See pH.

### **ANSI**

ANSI stands for the American National Standards Institute.

### **AUTO-IGNITION TEMPERATURE**

The auto-ignition temperature is the lowest temperature at which a material begins to burn in air in the absence of a spark or flame. Many chemicals will decompose (break down) when heated. The autoignition temperature is the temperature at which the chemicals formed by decomposition begin to burn. Auto-ignition temperatures for a specific material can vary by one hundred degrees Celsius or more, depending on the test method used.

Therefore, values listed on the MSDS may be rough estimates. To avoid the risk of fire or explosion, materials must be stored and handled at temperatures well below the auto-ignition temperature.

### **BASE, BASIC**

See pH.

### **BIOHAZARDOUS INFECTIOUS MATERIAL**

Under the Canadian Controlled Products Regulations, a biohazardous infectious material is a material that contains organisms which can cause disease in humans or animals. For example, a person exposed to a blood sample from someone with hepatitis B may contract the disease. Some jurisdictions require MSDSs for products which contain biohazardous infectious materials.

### **BOD**

BOD stands for biological oxygen demand.

### **BOILING POINT**

The boiling point is the temperature at which the material changes from a liquid to a gas. Below the boiling point, the liquid can evaporate to form a vapour. As the material approaches the boiling point, the change from liquid to vapour is rapid and vapour concentrations in the air can be extremely high. Airborne gases and vapours may pose fire, explosion and health hazards.

Sometimes, the boiling point of a mixture is given as a range of temperatures. This is because the different ingredients in a mixture can boil at different temperatures.

If the material decomposes (breaks down) without boiling, the temperature at which it decomposes may be given with the abbreviation "dec." Some of the decomposition chemicals may be hazardous. (See also Thermal Decomposition Products.)

## **CANUTEC**

CANUTEC stands for Canadian Transport Emergency Centre, which is part of the Transport Dangerous Goods Directorate of Transport Canada. CANUTEC provides information and communications assistance in case of transportation emergencies involving dangerous goods. It is accessible in Canada by telephone, 24 hours a day, year round at (613) 996-6666 (collect).

## **CARCINOGEN, CARCINOGENIC, CARCINOGENICITY**

A carcinogen is a substance which can cause cancer. Carcinogenic means able to cause cancer. Carcinogenicity is the ability of a substance to cause cancer.

Under the Canadian Controlled Products Regulations, materials are identified as carcinogens if they are recognized as carcinogens by the American Conference of Governmental Industrial Hygienists (ACGIH), or the International Agency for Research on Cancer (IARC).

Under the US OSHA Hazard Communication (Hazcom) Standard, materials are identified as carcinogens on MSDSs if they are listed as either carcinogens or potential carcinogens by IARC or the US National Toxicology Program (NTP), if they are regulated as carcinogens by OSHA, or if there is valid scientific evidence in man or animals demonstrating a cancer causing potential.

The lists of carcinogens published by the IARC, ACGIH and NTP include known human carcinogens and some materials which cause cancer in animal experiments. Certain chemicals may be listed as suspect or possible carcinogens if the evidence is limited or so variable that a definite conclusion cannot be made.

## **CAS REGISTRY NUMBER**

The CAS Registry Number is a number assigned to a material by the Chemical Abstracts Service (CAS) of the American Chemical Society (ACS). The CAS number provides a single unique identifier. A unique identifier is necessary because the same material can have many different names. For example, the name given to a specific chemical may vary from one language or country to another. The CAS Registry Number is similar to a telephone number and has no significance in terms of the chemical nature or hazards of the material. The CAS Registry Number can be used to locate additional information on the material, for example, when searching in books or chemical data bases.

## **CC**

Depending on the context, CC can stand for closed cup, cubic centimetres or ceiling concentration.

## **CCC**

CCC stands for Cleveland closed cup, a standard method of determining flash points.

## **CCOHS**

CCOHS stands for the Canadian Centre for Occupational Health and Safety. CCOHS provides an occupational health and safety information service through answers to inquiries, publications and a computerized information service. The computerized information is available both online (CCINFOWeb) and on CD-ROM (CCINFOdisc).

## **CEILING (C)**

See Exposure Limits for a general explanation.

## **CERCLA**

CERCLA stands for Comprehensive Environmental Response, Compensation and Liability Act (U.S.).

## **CHEMICAL FAMILY**

The chemical family describes the general nature of the chemical. Chemicals belonging to the same family often share certain physical and chemical properties and toxic effects. However, there may also be important differences. For example, toluene and benzene both belong to the aromatic hydrocarbon family. However, benzene is a carcinogen, but toluene is not.

## **CHEMICAL FORMULA**

The chemical formula, sometimes called the molecular formula, tells which elements (carbon, hydrogen, oxygen, and so on) make up a chemical. It also gives the number of atoms of each element in one unit or molecule of the chemical. The chemical formula can be used to confirm the identity of ingredients or to indicate the presence of a potentially hazardous element.

For example, zinc yellow has the chemical formula  $ZnCrO_4$ , which shows that it contains not only zinc (Zn) but also chromium (Cr).

## **CHEMICAL NAME**

The chemical name is a proper scientific name for an ingredient of a product. For example, the chemical name of the herbicide 2,4-D is 2,4-dichlorophenoxyacetic acid. The chemical name can be used to obtain additional information.

## **CHEMICAL REACTIVITY**

Chemical reactivity is the ability of a material to undergo a chemical change. A chemical reaction may occur under conditions such as heating, burning, contact with other chemicals, or exposure to light. Undesirable effects such as pressure buildup, temperature increase or formation of other hazardous chemicals may result. (See also Dangerously Reactive Material and Reactive Flammable Material.)

## **CHEMTREC**

CHEMTREC stands for the Chemical Transportation Emergency Centre. It is a U. S. national center established by the Chemical Manufacturers Association (CMA) to relay pertinent emergency information concerning specific chemicals on requests from individuals. CHEMTREC has a 24-hour toll-free telephone number to help respond to chemical transportation emergencies for companies who have registered with them for this service.

## **CHRONIC**

Chronic means long-term or prolonged. It can describe either an exposure or a health effect. A chronic exposure is a long-term exposure. Long-term means lasting for months or years. A chronic health effect is an adverse health effect resulting from long-term exposure or a persistent adverse health effect resulting from a short-term exposure. The Canadian Controlled Products Regulations describe technical criteria for identifying materials which cause chronic health effects. (See also Acute.)

## **CNS**

CNS stands for central nervous system.

## **COC**

COC stands for Cleveland open cup, a standard method of determining flash points.

## **COD**

COD stands for chemical oxygen demand.

## **COEFFICIENT OF OIL/WATER DISTRIBUTION**

The coefficient of oil/water distribution, also called the partition coefficient (abbreviated as P), is the ratio of the solubility of a chemical in an oil to its solubility in water. The P value is typically presented as a logarithm of P (log P). It indicates how easily a chemical can be absorbed into or stored in the body. The P value is also used to help determine the effects of the chemical on the environment.

## **COMBUSTIBLE**

Combustible means able to burn. Broadly speaking, a material is combustible if it can catch fire and burn. However, in many jurisdictions, the term combustible is given a specific regulatory meaning. (See Combustible Liquid.)

The terms combustible and flammable both describe the ability of a material to burn. Commonly, combustible materials are less easily ignited than flammable materials.

## **COMBUSTIBLE LIQUID**

Under the Canadian Controlled Products Regulations, a combustible liquid has a flash point from 37.8 to 93.3 degrees C (100 to 200 degrees F) using a closed cup test. The US OSHA Hazcom Standard uses a similar definition.

This range of flash points is well above normal room temperature. Combustible liquids are, therefore, less of a fire hazard than flammable liquids. If there is a possibility that a combustible liquid will be heated to a temperature near its flash point, appropriate precautions must be taken to prevent a fire or explosion.

## **COMPRESSED GAS**

A compressed gas is a material which is a gas at normal room temperature and pressure but is packaged as a pressurized gas, pressurized liquid or refrigerated liquid.

The Canadian Controlled Products Regulations and the U.S. Hazcom standard describe technical criteria for identifying materials which are classified as compressed gases.

Regardless of whether a compressed gas is packaged in an aerosol can, a pressurized cylinder or a refrigerated

container, it must be stored and handled very carefully. Puncturing or damaging the container or allowing the container to become hot may result in an explosion.

### **CONTROLLED PRODUCTS**

Under the Canadian Controlled Products Regulations, a controlled product is defined as a material, product or substance which is imported or sold in Canada and meets the criteria for one or more of the following classes:

Class A - Compressed Gas

Class B - Flammable and Combustible Material:

Division 1 - Flammable Gas

Division 2 - Flammable Liquid

Division 3 - Combustible Liquid

Division 4 - Flammable Solid

Division 5 - Flammable Aerosol

Division 6 - Reactive Flammable Material

Class C - Oxidizing Material

Class D - Poisonous and Infectious Material:

Division 1 - Material Causing Immediate and Serious Toxic

Effects:

Subdivision A - Very Toxic Material

Subdivision B - Toxic Material

Division 2 - Material Causing Other Toxic Effects:

Subdivision A - Very Toxic Material

Subdivision B - Toxic Material

Division 3 - Biohazardous Infectious Material

Class E - Corrosive Material

Class F - Dangerously Reactive Material

### **CONTROLLED PRODUCTS REGULATIONS (CPR)**

The Controlled Products Regulations are Canadian federal regulations developed under the Hazardous Products Act. They are part of the national Workplace Hazardous Materials Information System (WHMIS).

The regulations apply to all suppliers (importers or sellers) in Canada of controlled products intended for use in Canadian workplaces.

The regulations specify the criteria for identification of controlled products. They also specify what information must be included on labels and MSDSs.

### **CORROSIVE MATERIAL**

A corrosive material can attack (corrode) metals or human tissues such as the skin or eyes. Corrosive materials may cause metal containers or structural materials to become weak and eventually to leak or collapse. Corrosive materials can burn or destroy human tissues on contact and can cause effects such as permanent scarring or blindness.

The Canadian Controlled Products Regulations and the US OSHA Hazcom Standard, specify technical criteria for identifying materials which are classified as corrosive materials for the purposes of each regulation. (See also pH.)

### **CU M or CU.M**

This stands for cubic metre

### **DANGEROUSLY REACTIVE MATERIAL**

The Canadian Controlled Products Regulations describes technical criteria for identifying materials which are classified as dangerously reactive. A dangerously reactive material can react vigorously:

- with water to produce a very toxic gas;
- on its own by polymerization or decomposition; or
- under conditions of shock, or an increase in pressure or temperature.

ANSI defines a dangerously reactive material as one that is able to undergo a violent self-accelerating exothermic chemical reaction with common materials, or by itself.

A dangerously reactive material may cause a fire, explosion or other hazardous condition. It is very important to

know which conditions (such as shock, heating or contact with water) may set off the dangerous reaction so that appropriate preventive measures can be taken.

See also the U.S. OSHA HAZCOM definitions for unstable (reactive) and water reactive.

### **DENSITY**

The density of a material is its weight for a given volume. Density is usually given in units of grams per millilitre (g/mL) or grams per cubic centimetre (g/cc). Density is closely related to specific gravity (relative density). The volume of a material in a container can be calculated from its density and weight.

### **DILUTION VENTILATION**

See General Ventilation.

### **DOT**

DOT stands for the U.S. Department of Transportation.

### **EMBRYO**

An embryo is an organism in the early stages of its development prior to birth. In humans, the embryo is the developing child from conception to the end of the second month of pregnancy. (See also Fetus/Foetus.)

### **EMBRYOTOXIC, EMBRYOTOXICITY**

Embryotoxic means harmful to the embryo. Embryotoxicity is the ability of a substance to cause harm to the embryo. The Canadian Controlled Products Regulations describe technical criteria for identifying materials which have teratogenicity and embryotoxicity. (See also Fetotoxicity and Reproductive Effects.) Under the U.S. OSHA HAZCOM standard, embryotoxic effects are included as Target Organ Effects.

### **ENGINEERING CONTROLS**

Engineering controls help reduce exposure to potential hazards either by isolating the hazard or by removing it from the work environment. Engineering controls include mechanical ventilation and process enclosure. They are important because they are built into the work process.

Engineering controls are usually preferred to other control measures such as the use of personal protective equipment. Substitution of a less hazardous material or industrial process is the best way to reduce a hazard and is often considered to be a type of engineering control.

### **EPA**

EPA stands for the U.S. Environmental Protection Agency.

### **EU**

EU stands for the European Union, formerly known as the EEC (European Economic Community) and the EC (European Community).

### **EVAPORATION RATE**

The evaporation rate is a measure of how quickly the material becomes a vapour at normal room temperature. Usually, the evaporation rate is given in comparison to certain chemicals, such as butyl acetate, which evaporate fairly quickly. For example, the rate might be given as "0.5 (butyl acetate=1)." This means that, under specific conditions, 0.5 grams of the material evaporates during the same time that 1 gram of butyl acetate evaporates. Often, the evaporation rate is given only as greater or less than 1, which means the material evaporates faster or slower than the comparison chemical.

In general, a hazardous material with a higher evaporation rate presents a greater hazard than a similar compound with a lower evaporation rate.

### **EXPLOSION DATA**

Explosion data is information on the explosive properties of a material. Quantitative explosion data is seldom available and is usually given in descriptive terms such as low, moderate or high.

The following types of information can be used to describe the explosive hazard of a material:

- Sensitivity to mechanical impact. This information indicates whether or not the material will burn or explode on shock (for example, dropping a package) or friction (for example, scooping up spilled material).
- Sensitivity to static discharge. This information indicates how readily the material can be ignited by an electric spark.

Detailed information is available on the properties of commercial explosives. In Canada, the storage, transportation and handling of commercial explosives are strictly regulated under the Explosives Act and TDG.

Commercial explosives are not regulated by the Controlled Products Regulations.

Under the U.S. OSHA HAZCOM standard, a chemical is identified as explosive if it causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature.

### **EXPLOSIVE LIMITS**

Explosive limits specify the concentration range of a material in air which will burn or explode in the presence of an ignition source (spark or flame). Explosive limits may also be called flammable limits or explosion limits. The lower explosive limit (LEL), or lower flammable limit (LFL), is the lowest concentration of gas or vapour which will burn or explode if ignited. The upper explosive limit (UEL), or upper flammable limit (UFL), is the highest concentration of gas or vapour which will burn or explode if ignited. From the LEL to the UEL, the mixture is explosive. Below the LEL, the mixture is too lean to burn. Above the UEL, the mixture is too rich to burn. However, concentrations above the UEL are still very dangerous because, if the concentration is lowered (for example, by introducing fresh air), it will enter the explosive range.

In reality, explosive limits for a material vary since they depend on many factors such as air temperature. Therefore, the values given on an MSDS are approximate.

The explosive limits are usually given as the percent by volume of the material in the air. One percent by volume is 10,000 ppm. For example, gasoline has a LEL of 1.4% and a UEL of 7.6%. This means that gasoline vapours at concentrations of 1.4% to 7.6% (14,000 to 76,000 ppm) are flammable or explosive.

### **EXPOSURE LIMITS (OR OCCUPATIONAL EXPOSURE LIMITS (OELs))**

An exposure limit is the concentration of a chemical in the workplace air to which most people can be exposed without experiencing harmful effects. Exposure limits should not be taken as sharp dividing lines between safe and unsafe exposures. It is possible for a chemical to cause health effects, in some people, at concentrations lower than the exposure limit.

Exposure limits have different names and different meanings depending on who developed them and whether or not they are legal limits. For example, Threshold Limit Values (TLVs) are exposure guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH). They have been adopted by many Canadian governments as their legal limits. Permissible Exposure Limits (PELs) are legal exposure limits in the United States. Sometimes, a manufacturer will recommend an exposure limit for a material.

Exposure limits have not been set for many chemicals, for many different reasons. For example, there may not be enough information available to set an exposure limit. Therefore, the absence of an exposure limit does not necessarily mean the material is not harmful. There are three different types of exposure limits in common use:

1) Time-weighted average (TWA) exposure limit is the time-weighted average concentration of a chemical in air for a normal 8-hour work day and 40-hour work week to which nearly all workers may be exposed day after day without harmful effects. Time-weighted average means that the average concentration has been calculated using the duration of exposure to different concentrations of the chemical during a specific time period. In this way, higher and lower exposures are averaged over the day or week.

2) Short-term exposure limit (STEL) is the average concentration to which workers can be exposed for a short period (usually 15 minutes) without experiencing irritation, long-term or irreversible tissue damage, or reduced alertness. The number of times the concentration reaches the STEL and the amount of time between these occurrences can also be restricted.

3) Ceiling (C) exposure limit is the concentration which should not be exceeded at any time.

SKIN notation (SKIN) means that contact with the skin, eyes and moist tissues (for example, the mouth) can contribute to the overall exposure. The purpose of this notation is to suggest that measures be used to prevent absorption by these routes; for example, the use of protective gloves. If absorption occurs through the skin, then the airborne exposure limits are not relevant.

### **EXTINGUISHING MEDIA**

Extinguishing media are agents which can put out fires involving the material. Common extinguishing agents are water, carbon dioxide, dry chemical, "alcohol" foam, and halogenated gases (Halons). It is important to know which extinguishers can be used so they can be made available at the worksite. It is also important to know which agents cannot be used since an incorrect extinguisher may not work or may create a more hazardous situation. If several materials are involved in a fire, an extinguisher effective for all of the materials should be used.

## **FDA**

FDA stands for the Food and Drug Administration (U.S.).

## **FETOTOXIC, FETOTOXICITY**

Fetotoxic means the substance is harmful to the fetus/foetus. Fetotoxicity describes the ability of a substance to harm the fetus. (See also Embryotoxicity, Teratogenicity and Reproductive Effects.)

## **FETUS/FOETUS**

A fetus is an organism in the later stages of development prior to birth. In humans, it is the unborn child from the end of the second month of pregnancy to birth. (See also Embryo.)

## **FIFRA**

FIFRA stands for Federal Insecticide, Fungicide and Rodenticide Act (U.S.).

## **FIRST AID**

First aid is emergency care given immediately to an injured person. The purpose of first aid is to minimize injury and future disability. In serious cases, first aid may be necessary to keep the victim alive.

## **FLAMMABLE, FLAMMABILITY**

Flammable means able to ignite and burn readily. Flammability is the ability of a material to ignite and burn readily. (See also Combustible.) Under the Canadian Controlled Products Regulations and the U.S. HAZCOM Standard, there are specific technical criteria for identifying flammable materials. (See Flammable Aerosol, Flammable Gas, Flammable Liquid, Flammable Solid and Reactive Flammable Material.)

There are closely related criteria for the classification of certain flammable materials under the Canadian Transportation of Dangerous Goods (TDG) Regulations and the U.S. Department of Transportation regulations. (See TDG Flammability Classification.) In Canada, at least, local, provincial and national fire codes also classify and regulate the use of flammable materials in workplaces. (See also Combustible.)

## **FLAMMABLE AEROSOL**

Under the Canadian Controlled Products Regulations, a material is identified as a flammable aerosol if it is packaged in an aerosol container which can release a flammable material. A flammable aerosol is hazardous because it may form a torch (explosive ignition of the spray) or because a fire fueled by the flammable aerosol may flash back.

The U.S. OSHA HAZCOM Standard has a specific definition. Refer to the regulations for detailed information.

## **FLAMMABLE AND COMBUSTIBLE MATERIAL**

Under the Canadian Controlled Products Regulations, a material may be classified as a flammable and combustible material if it meets specific criteria for a flammable gas, flammable liquid, combustible liquid, flammable solid, flammable aerosol or reactive flammable material.

## **FLAMMABLE GAS**

A flammable gas is a gas which can ignite readily and burn rapidly or explosively. Under the Canadian Controlled Products Regulations and under the US Hazard Communication Standard, there are certain technical criteria for the identification of materials as flammable gases for the purposes of each regulation. Flammable gases can be extremely hazardous in the workplace; for example:

- If the gas accumulates so that its lower explosive limit (LEL) is reached and if there is a source of ignition, an explosion may occur.
- If there is inadequate ventilation, flammable gases can travel a considerable distance to a source of ignition and flash back to the source of the gas.

## **FLAMMABLE LIMITS**

See Explosive Limits.

## **FLAMMABLE LIQUID**

A flammable liquid gives off a vapour which can be readily ignited at normal working temperatures. Under the Canadian Controlled Products Regulations, a flammable liquid is a liquid with a flash point (using a closed cup test) below 37.8 degrees C (100 degrees F). The US Hazard Communication Standard uses a similar, but not identical, definition.

Flammable liquids can be extremely hazardous in the workplace; for example:

- If there is inadequate ventilation, vapours can travel considerable distances to a source of ignition and flash back



to the flammable liquid.

- It may be difficult to extinguish a burning flammable liquid with water because water may not be able to cool the liquid below its flash point.

### **FLAMMABLE SOLID**

A flammable solid is a material which can ignite readily and burn vigorously and persistently. There are certain technical criteria in the Canadian Controlled Products Regulations and in the US OSHA Hazard Communication Standard for the identification of flammable solids for the purposes of each regulation. These criteria are based on ease of ignition and rate of burning. Flammable solids may be hazardous because heat from friction (for example, surfaces rubbing together) or heat from processing may cause a fire. Flammable solids in the form of a dust or powder may be particularly hazardous because they may explode if ignited.

### **FLASH BACK**

Flash back occurs when a trail of flammable gas, vapour or aerosol is ignited by a distant spark, flame or other source of ignition. The flame then travels back along the trail of gas, vapour or aerosol to its source. A serious fire or explosion could result.

### **FLASH POINT**

The flash point is the lowest temperature at which a liquid or solid gives off enough vapour to form a flammable air-vapour mixture near its surface. The lower the flash point, the greater the fire hazard. The flash point is an approximate value and should not be taken as a sharp dividing line between safe and hazardous conditions. The flash point is determined by a variety of test methods which give different results. Two types of methods are abbreviated as OC (open cup) and CC (closed cup).

### **FR**

FR stands for Federal Register (U.S.).

### **FREEZING POINT**

See Melting Point.

### **FUMES**

Fumes are very small, airborne, solid particles formed by the cooling of a hot vapour. For example, a hot zinc vapour may form when zinc-coated steel is welded. The vapour then condenses to form fine zinc fume as soon as it contacts the cool surrounding air. Fumes are smaller than dusts and are more easily breathed into the lungs.

### **GAS**

A gas is a material without a specific shape or volume. Gases tend to occupy an entire space uniformly at normal room pressure and temperature. The terms vapour and fume are sometimes confused with gas.

### **GENERAL VENTILATION**

As used in an MSDS, general ventilation, also known as dilution ventilation, is the removal of contaminated air from the general area and the bringing in of clean air. This dilutes the amount of contaminant in the work environment. General ventilation is usually suggested for non-hazardous materials. (See also Mechanical Ventilation, Local Exhaust Ventilation and Ventilation.)

### **GI**

GI stands for gastrointestinal (relating to the stomach and intestines).

### **HAZARD, HAZARDOUS**

Hazard is the potential for harmful effects. Hazardous means potentially harmful. The hazards of a material are evaluated by examining the properties of the material, such as toxicity, flammability and chemical reactivity, as well as how the material is used. How a material is used can vary greatly from workplace to workplace and, therefore, so can the hazard.

In Canada and the U.S., the term hazardous is used by many different regulatory agencies. Definitions may vary. For example, OSHA defines a hazardous chemical as any chemical which is a physical hazard or a health hazard according to the OSHA Hazard Communication (Hazcom) criteria.

### **HAZARDOUS COMBUSTION PRODUCTS**

Hazardous combustion products are chemicals which may be formed when a material burns. These chemicals may be toxic, flammable or have other hazards. The chemicals released and their amounts vary, depending upon conditions such as the temperature and the amount of air (or more specifically, oxygen) available. The combustion

chemicals may be quite different from those formed by heating the same material during processing (thermal decomposition products). It is important to know which chemicals are formed by hazardous combustion in order to plan the response to a fire involving the material.

### **HAZARDOUS DECOMPOSITION PRODUCTS**

Hazardous decomposition products are formed when a material decomposes (breaks down) because it is unstable, or reacts with common materials such as water or oxygen (in air). This information should be considered when planning storage and handling procedures.

### **HAZARDOUS INGREDIENT**

Under the Canadian Hazardous Products Act, a chemical must be listed in the Hazardous Ingredients Section of an MSDS if:

- it meets the criteria for a controlled product;
- it is on the Ingredient Disclosure List;
- there is no toxicological information available; or
- the supplier has reason to believe it might be hazardous.

Certain chemicals may be exempt from disclosure on an MSDS if they meet specific criteria set out in the Hazardous Materials Information Review Act.

### **HAZARDOUS POLYMERIZATION**

See Polymerize, Polymerization.

### **HAZCOM**

HAZCOM stands for the Hazard Communication Standard (U.S.) (29CFR1910.1200).

### **HEPATOTOXIN**

Hepatotoxins are agents that can cause toxic effects on the liver.

### **HIGHLY TOXIC**

Under the U.S. OSHA HAZCOM Standard, there are specific criteria for materials which must be identified as toxic. The corresponding term under Canadian WHMIS is "Very Toxic" (criteria are not the same). **HR** HR stands for hour.

### **IARC**

IARC stands for the International Agency for Research on Cancer. IARC evaluates information on the carcinogenicity of chemicals, groups of chemicals and chemicals associated with certain industrial processes. IARC has published lists of chemicals which are generally recognized as human carcinogens, probable human carcinogens or carcinogens in animal tests.

### **IATA**

IATA stands for International Air Transport Association.

### **IDLH**

IDLH stands for Immediately Dangerous to Life or Health. For the purposes of respirator selection, NIOSH defines the IDLH concentration as the airborne concentration that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment. The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment. In the event of failure of respiratory protective equipment, every effort should be made to exit immediately.

### **ILO**

ILO stands for the International Labour Office.

### **IMPERVIOUS**

On an MSDS, impervious is a term used to describe protective gloves and other protective clothing. If a material is impervious to a chemical, then that chemical cannot readily penetrate through the material or damage the material. Different materials are impervious (resistant) to different chemicals. No single material is impervious to all chemicals. If an MSDS recommends wearing impervious gloves, you need to know the type of material from which the gloves should be made. For example, neoprene gloves are impervious to butyl alcohol but not to ethyl alcohol.

## **INCOMPATIBLE MATERIALS**

Incompatible materials can react with the product or with components of the product and may:

- destroy the structure or function of a product;
- cause a fire, explosion or violent reaction; or
- cause the release of hazardous chemicals.

## **INERT INGREDIENT**

An inert ingredient is anything other than the active ingredient of a product. It may be a solvent, colorant, filler or dispersing agent. In some cases, inert ingredients may be hazardous.

## **INGESTION**

Ingestion means taking a material into the body by mouth (swallowing).

## **INHALATION**

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

## **IRRITANCY, IRRITATION**

Irritancy is the ability of a material to irritate the skin, eyes, nose, throat or any other part of the body that it contacts. Signs and symptoms of irritation include tearing in the eyes and reddening, swelling, itching and pain of the affected part of the body.

Irritancy is often described as mild, moderate or severe, depending on the degree of irritation caused by a specific amount of the material. Irritancy may also be described by a number on a scale of 0 to 4, where 0 indicates no irritation and 4 means severe irritation. Irritancy is usually determined in animal experiments.

The Canadian Controlled Products Regulations and the U.S. OSHA Hazcom Standard describe technical criteria for identifying materials which are skin or eye irritants for the purposes of each regulation.

## **ISO**

ISO stands for the International Standards Organization.

## **KG**

KG stands for kilogram

## **Kow**

Kow stands for octanol/water partition coefficient.

## **LC50**

LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. The LC50 helps determine the short-term poisoning potential of a material.

More detailed information is available on the LC50 in the CCOHS publication What is an LD50?

## **LD50**

LD stands for lethal dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD50 can be determined for any route of entry, but dermal (applied to skin) and oral (given by mouth) LD50's are most common. The LD50 is one measure of the short-term poisoning potential of a material. (See also LC50.)

More detailed information is available in the CCOHS publication "What is an LD50?"

## **LCLO**

LCLO stands for lowest lethal airborne concentration tested. (See also LC50 and LD50.)

## **LDLO**

LDLO stands for lowest lethal dose tested. (See also LC50 and LD50.)

## **LEL**

See Explosive Limits.

## **LFL**

See Explosive Limits.

## **LOCAL EXHAUST VENTILATION**

Local exhaust ventilation is the removal of contaminated air directly at its source. This type of ventilation can help reduce worker exposure to airborne materials more effectively than general ventilation. This is because it does not allow the material to enter the work environment. It is usually recommended for hazardous airborne materials.

(See also Mechanical Ventilation and Ventilation.)

### **LOWER EXPLOSION LIMIT**

See Explosive Limits.

### **LOWER EXPLOSIVE LIMIT**

See Explosive Limits.

### **LOWER FLAMMABLE LIMIT**

See Explosive Limits.

### **MATERIAL CAUSING IMMEDIATE AND SERIOUS TOXIC EFFECTS**

The Canadian Controlled Products Regulations describe technical criteria for identifying materials which cause immediate and serious toxic effects. These criteria use information such as the LD50 or LC50 for a material. Based on the specific information, a material may be identified as toxic or very toxic in the class Poisonous and Infectious Material.

### **MATERIAL CAUSING OTHER TOXIC EFFECTS**

The Canadian Controlled Products Regulations describe technical criteria for identifying materials which cause toxic effects such as skin or respiratory sensitization, mutagenicity and carcinogenicity. Based on the specific information, a material may be identified as toxic or very toxic in the class Poisonous and Infectious Material.

### **MEANS OF EXTINCTION**

See Extinguishing Media.

### **MECHANICAL VENTILATION**

Mechanical ventilation is the movement of air by mechanical means (for example, a wall fan). There are two kinds of mechanical ventilation: general ventilation and local exhaust ventilation. (See also Ventilation.)

### **MELTING POINT**

The melting point is the temperature at which a solid material becomes a liquid. The freezing point is the temperature at which a liquid material becomes a solid. Usually one value or the other is given on the MSDS. It is important to know the freezing or melting point for storage and handling purposes. For example, a frozen or melted material may burst a container. As well, a change of physical state could alter the hazards of the material.

### **MESA**

MESA stands for Mining Enforcement and Safety Administration. MESA was the United States government agency responsible for enforcing the health and safety regulations and standards for American miners. It was replaced by MSHA in 1978.

### **mg/m<sup>3</sup>**

The abbreviation mg/m<sup>3</sup> stands for milligrams (mg) of a material per cubic metre (m<sup>3</sup>) of air. It is a unit of metric measurement for concentration (weight/volume). The concentrations of any airborne chemical can be measured in mg/m<sup>3</sup>, whether it is a solid, liquid, gas or vapour.

### **MIN**

MIN can stand for minute or minimum.

### **MISCIBLE**

Miscible means able to be mixed. Two liquids are said to be miscible if they are partially or completely soluble in each other. Commonly, the term miscible is understood to mean that the two liquids are completely soluble in each other. (See also Solubility.)

### **MIST**

A mist is a collection of liquid droplets suspended in air. A mist can be formed when spraying or splashing a liquid. It can also be formed when a vapour condenses into liquid droplets in the air. (See also Aerosol.)

### **ML**

ML stands for millilitres (mL).

### **mm Hg**

The abbreviation mm Hg stands for millimeters (mm) of mercury (Hg). It is a common unit of measurement for the pressure exerted by gases such as air. Normal atmospheric pressure is 760 mm Hg.

### **MOLECULAR FORMULA**

See Chemical Formula.

## **MOLECULAR WEIGHT**

The molecular weight of a chemical is a number showing how heavy one molecule (or unit) of the chemical is compared to the lightest element, hydrogen, which has a weight of 1. The molecular weight has various technical uses, such as calculating conversions from parts per million (ppm) to milligrams per cubic metre (mg/m<sup>3</sup>) in air.

## **MSHA**

MSHA stands for Mine Safety and Health Administration. MSHA is the United States government agency responsible for enforcing the health and safety regulations and standards for American miners. It replaced MESA in 1978.

## **MUTAGEN, MUTAGENIC, MUTAGENICITY**

A mutagen is a substance which can cause changes in the DNA of cells (mutations). Mutagenic means able to cause mutations. Mutagenicity is the ability of a substance to cause mutations.

DNA determines the characteristics that children inherit from their parents. DNA also determines how cells in the body divide or reproduce.

A number of mutagenicity tests are used to screen chemicals for possible carcinogenicity or reproductive effects. This is because there is some evidence that mutations may increase the risk of cancer and reproductive problems such as infertility or birth defects. However, mutagenicity test results are not very reliable predictors of these effects. One reason for this is that the human body can repair mutations while most mutagenicity tests cannot. Mutagenicity is included on MSDSs because it is an early indicator of potential hazard, and often there is very little other evidence available on possible carcinogenic or reproductive effects. The Canadian Controlled Products Regulations describes technical criteria for identifying materials which are mutagenic. The U.S. OSHA HAZCOM Standard includes mutagenic effects as reproductive target organ effects.

## **NA NUMBER**

See UN Number.

## **NATURAL VENTILATION**

Natural ventilation is a type of general ventilation which depends on natural instead of mechanical means for air movement. Natural ventilation can depend on the wind or the difference in temperature from one area to another to move air through a building. Therefore, it is unpredictable and unreliable. (See also Local Exhaust Ventilation, Mechanical Ventilation and Ventilation.)

## **NEPHROTOXINS**

Nephrotoxins are agents that can cause toxic effects on the kidney.

## **NEUROTOXINS**

Neurotoxins are agents that can cause toxic effects on the nervous system.

## **NFPA**

NFPA stands for National Fire Protection Association (U.S.).

## **NIOSH**

NIOSH stands for National Institute for Occupational Safety and Health. NIOSH is a branch of the United States government which undertakes research and develops occupational health and safety standards.

## **NOEL**

NOEL stands for No Observable Effect Level.

## **NOS**

NOS stands for not otherwise specified.

## **NTP**

NTP stands for National Toxicology Program. This program is part of the United States Department of Health and Human Services. The NTP has a large program for testing the potential carcinogenicity of chemicals. It also does many other types of studies on short-term and long-term health effects.

## **NUISANCE DUST, NUISANCE PARTICULATE (see Particulates Not Otherwise**

Classified) Nuisance particulate is a term used historically by the ACGIH to describe airborne materials (solids and liquids) which have little harmful effect on the lungs and do not produce significant disease or harmful effects when exposures are kept under reasonable control. Nuisance particulates may also be called nuisance dusts. High levels of nuisance particulates in the air may reduce visibility and can get into the eyes, ears and nose.

Removal of this material by washing or rubbing may cause irritation.

## **OC**

OC stands for open cup.

## **ODOUR THRESHOLD**

The odour threshold is the lowest concentration of a chemical in air that is detectable by smell. The odour threshold should only be regarded as an estimate. This is because odour thresholds are commonly determined under controlled laboratory conditions using people trained in odour recognition.

As well, in the workplace, the ability to detect the odour of a chemical varies from person to person and depends on conditions such as the presence of other odorous materials.

Odour cannot be used as a warning of unsafe conditions since workers may become used to the smell (adaptation), or the chemical may numb the sense of smell, a process called olfactory fatigue. However, if the odour threshold for a chemical is well below its exposure limit, odour can be used to warn of a problem with your respirator.

## **OECD**

OECD stands for Organization for Economic Cooperation and Development. The OECD is an international agency which supports programs designed to facilitate trade and development.

The OECD has published "Guidelines for Testing of Chemicals." These guidelines contain recommended procedures for testing chemicals for toxic and environmental effects and for determining physical and chemical properties.

## **OEL**

OEL stands for Occupational Exposure Limit. (See Exposure Limits for a general explanation.)

## **OSHA**

OSHA stands for Occupational Safety and Health Administration. It is the branch of the United States government which sets and enforces occupational health and safety regulations. For example, OSHA sets the legal exposure limits in the United States, which are called Permissible Exposure Limits (PELs). OSHA also specifies what information must be given on labels and Material Safety Data Sheets for materials which have been classified as hazardous using their criteria.

## **OXIDIZING AGENT, OXIDIZING MATERIAL**

An oxidizing agent or material gives up oxygen easily or can readily oxidize other materials. Examples of oxidizing agents are oxygen, chlorine and peroxide compounds. These chemicals will support a fire and are highly reactive. Under the Canadian Controlled Products Regulations and under the U.S. OSHA Hazcom Standard, there are specific criteria for the classification of materials as oxidizing materials.

## **PARTICULATES NOT OTHERWISE CLASSIFIED (PNOC)**

Particulates not otherwise classified is a term defined by the ACGIH. It is used to describe particulates for which there is no evidence of specific toxic effects such as fibrosis or systemic effects. These material are not to be considered inert, however, and can produce general toxic effects depending on the airborne concentration.

## **PARTITION COEFFICIENT**

See Coefficient of Oil/Water Distribution.

## **PEL**

PEL stands for Permissible Exposure Limit. PELs are legal limits in the United States set by the Occupational Safety and Health Administration (OSHA). (See Exposure Limits for a general explanation.)

## **PENSKY-MARTENS CLOSED CUP**

Pensky-Martens Closed Cup (PMCC) is a specific method for determining flash points.

## **PERSONAL PROTECTIVE EQUIPMENT**

Personal protective equipment is clothing or devices worn to help isolate a person from direct exposure to a hazardous material or situation. Recommended personal protective equipment is often listed on an MSDS. This can include protective clothing, respiratory protection and eye protection.

The use of personal protective equipment is the least preferred method of protection from hazardous exposures. It can be unreliable and, if it fails, the person can be left completely unprotected. This is why engineering controls are preferred. Sometimes, personal protective equipment may be needed along with engineering controls. For

example, a ventilation system (an engineering control) reduces the inhalation hazard of a chemical, while gloves and an apron (personal protective equipment) reduce skin contact. In addition, personal protective equipment can be an important means of protection when engineering controls are not practical: for example, during an emergency or other temporary conditions such as maintenance operations.

### **pH**

The pH is a measure of the acidity or basicity (alkalinity) of a material when dissolved in water. It is expressed on a scale from 0 to 14. Roughly, pH can be divided into the following ranges:

pH 0 - 2	Strongly acidic
pH 3 - 5	Weakly acidic
pH 6 - 8	Neutral
pH 9 - 11	Weakly basic
pH 12 - 14	Strongly basic

Under the Canadian Controlled Products Regulations, materials with pH values of 0-2 or 11.5-14 may be classified corrosive. Corrosive materials must be stored and handled with great care.

### **PIN**

See UN Number.

### **PMCC**

See Pensky-Martens Closed Cup

### **PNS**

PNS stands for peripheral nervous system.

### **POISONOUS AND INFECTIOUS MATERIAL**

Under the Canadian Controlled Products Regulations, a Poisonous and Infectious Material is any material which meets the criteria for a Material Causing Immediate and Serious Toxic Effects, a Material Causing Other Toxic Effects, or a Biohazardous Infectious Material.

### **POLYMER**

A polymer is a natural or man-made material formed by combining units, called monomers, into long chains. The word polymer means many parts. Examples of polymers are starch (which has many sugar units), polyethylene (which has many ethylene units) and polystyrene (which has many styrene units).

Most man-made polymers have low toxicity, low flammability and low chemical reactivity. In these ways, polymers tend to be less hazardous than the chemicals (monomers) from which they are made.

### **POLYMERIZE, POLYMERIZATION**

Polymerization is the process of forming a polymer by combining large numbers of chemical units or monomers into long chains. Polymerization can be used to make some useful materials. However, uncontrolled polymerization can be extremely hazardous. Some polymerization processes can release considerable heat, can generate enough pressure to burst a container or can be explosive. Some chemicals can polymerize on their own without warning. Others can polymerize upon contact with water, air or other common chemicals. Inhibitors are normally added to products to reduce or eliminate the possibility of uncontrolled polymerization. Most MSDSs have a section called "Hazardous Polymerization" which indicates whether hazardous polymerization reactions can occur.

### **ppb**

ppb stands for parts per billion.

### **ppm**

The abbreviation ppm stands for parts per million. It is a common unit of concentration of gases or vapour in air. For example, 1 ppm of a gas means that 1 unit of the gas is present for every 1 million units of air. One ppm is the same as 1 minute in 2 years or 1 cent in \$10,000.

### **PROCESS ENCLOSURE**

As used on an MSDS, process enclosure means that the operation in which the material is used is completely enclosed. A physical barrier separates the worker from the potential health or fire hazard. Process enclosure is usually recommended if the material is very toxic or flammable.

**PSI**

PSI stands for pounds per square inch and is a unit of pressure.

**PYROPHORIC**

Pyrophoric chemicals are defined in the U.S. OSHA Hazcom Standard as chemicals which will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below. Regulatory definitions in other jurisdictions may differ.

**RCRA**

RCRA stands for Resource Conservation and Recovery Act (U.S.) It is a statute regulating waste that is administered by the U.S. EPA.

**REACTIVE FLAMMABLE MATERIAL**

Under the Canadian Controlled Products Regulations, a reactive flammable material is a material which is a dangerous fire risk because it can react readily with air or water. This category includes any material which:

- is spontaneously combustible, that is, a material which can react with air until enough heat builds up that it begins to burn;
- can react vigorously with air under normal conditions without actually catching fire;
- gives off dangerous quantities of flammable gas on reaction with water; or
- becomes spontaneously combustible when it contacts water or water vapour.

Reactive flammable materials must be kept dry and isolated from oxygen (in air) or other oxidizing agents. Therefore, they are often stored and handled in an atmosphere of unreactive gas, such as nitrogen or argon.

**RELATIVE DENSITY**

See Specific Gravity.

**REPRODUCTIVE EFFECTS**

Reproductive effects are problems in the reproductive process which may be caused by a substance. Possible reproductive effects include reduced fertility in the male or female, menstrual changes, miscarriage, embryotoxicity, fetotoxicity, teratogenicity, or harmful effects to the nursing infant from chemicals in breast milk. Most chemicals can cause reproductive effects if there is an extremely high exposure. In these cases, the exposed person would experience other noticeable signs and symptoms caused by the exposure. These signs and symptoms act as a warning of toxicity. Chemicals which cause reproductive effects in the absence of other significant harmful effects are regarded as true reproductive hazards. Very few workplace chemicals are known to be true reproductive hazards.

**REPRODUCTIVE TOXICITY**

The Canadian Controlled Products Regulations describe technical criteria for identifying materials which have reproductive toxicity. These criteria refer to adverse effects on fertility. (See also Reproductive Effects.) Other jurisdictions likely have corresponding criteria, which may differ.

Under the U.S. OSHA HAZCOM Standard, Reproductive Toxicity is a Target Organ Effect, and includes mutagens, embryotoxins, teratogens and reproductive toxins.

**RESPIRATORY SENSITIZATION**

See Sensitization.

**RQ**

RQ stands for reportable quantity.

**RTECS**

RTECS stands for Registry of Toxic Effects of Chemical Substances.

**SARA**

SARA stands for Superfund Amendments and Reauthorization Act of 1986 (U.S.).

**SEC**

SEC stands for second or section.

**SENSITIZATION**

Sensitization is the development, over time, of an allergic reaction to a chemical. The chemical may cause a mild response on the first few exposures but, as the allergy develops, the response becomes worse with subsequent exposures. Eventually, even short exposures to low concentrations can cause a very severe reaction.



There are two different types of occupational sensitization: skin and respiratory. Typical symptoms of skin sensitivity are swelling, redness, itching, pain, and blistering. Sensitization of the respiratory system may result in symptoms similar to a severe asthmatic attack. These symptoms include wheezing, difficulty in breathing, chest tightness, coughing and shortness of breath.

The Canadian Controlled Products Regulations and the U.S. OSHA HAZCOM Standard describe technical criteria for identifying materials which are respiratory tract sensitizers or skin sensitizers.

### **SKIN NOTATION**

See Exposure Limits for a general explanation.

### **SKIN SENSITIZATION**

See Sensitization.

### **SOLUBILITY**

Solubility is the ability of a material to dissolve in water or another liquid. Solubility may be expressed as a ratio or may be described using words such as insoluble, very soluble or miscible.

Often, on an MSDS, the "Solubility" section describes solubility in water since water is the single most important industrial solvent. Solubility information is useful for planning spill clean-up and fire fighting procedures.

### **SOLVENT**

A solvent is a material, usually a liquid, which is capable of dissolving another chemical. Chemicals commonly called solvents can dissolve many different chemicals. Examples of common solvents are water, ethanol, acetone, hexane and toluene.

### **SPECIFIC GRAVITY**

Specific gravity is the ratio of the density of a material to the density of water. The density of water is about 1 gram per cubic centimetre (g/cc). Materials which are lighter than water (specific gravity less than 1.0) will float. Most materials have specific gravities exceeding 1.0, which means they are heavier than water and so will sink.

Knowing the specific gravity is important for planning spill clean-up and fire fighting procedures. For example, a light flammable liquid such as gasoline may spread and, if ignited, burn on top of a water surface.

### **STABILITY**

Stability is the ability of a material to remain unchanged in the presence of heat, moisture or air. An unstable material may decompose, polymerize, burn or explode under normal environmental conditions. Any indication that the material is unstable gives warning that special handling and storage precautions may be necessary.

### **STEL**

STEL stands for Short-Term Exposure Limit. (See Exposure Limits for a general explanation.)

### **STP**

STP stands for Standard Temperature and Pressure (0 degrees Celsius and one atmosphere pressure).

### **SYNERGISTIC, SYNERGISM**

As used on an MSDS, synergism means that exposure to more than one chemical can result in health effects greater than expected when the effects of exposure to each chemical are added together. Very simply, it is like saying  $1 + 1 = 3$ . When chemicals are synergistic, the potential hazards of the chemicals should be re-evaluated, taking their synergistic properties into consideration.

### **SYNONYMS**

Synonyms are alternative names for the same chemical. For example, methanol and methyl hydrate are synonyms for methyl alcohol. Synonyms may help in locating additional information on a chemical.

### **TARGET ORGAN EFFECTS**

Under the U.S. OSHA HAZCOM Standard, chemicals are identified as having target organ effects if there is statistically significant evidence of an acute or chronic health effect determined in a scientifically valid study. The following agents would be included (note, the list is not all-inclusive): hepatotoxins, agents which damage the lungs (including irritants), agents which act on the hematopoietic system, neurotoxins, nephrotoxins, reproductive toxins (mutagens, embryotoxins, teratogens and reproductive toxins), cutaneous hazards (chemicals which affect the dermal layer of the skin) and eye hazards (chemicals which affect the eye or visual capacity). There are no maximum dose criteria for chronic toxicity studies, as specified in the Canadian Controlled Products Regulations.

### **TCC**

TCC stands for Tagliabue closed cup; a standard method of determining flash points. Generally, this appears in abbreviated form as Tag closed cup.

### **TCLO**

TCLO stands for lowest toxic airborne concentration tested (see also LCLO and LC50).

### **TDG**

TDG stands for Transportation of Dangerous Goods. In Canada, the transportation of potentially hazardous materials is regulated under the federal Transportation of Dangerous Goods Act and Regulations which are administered by Transport Canada. The TDG Act and Regulations set out criteria for the classification of materials as dangerous goods and state how these materials must be packaged and shipped.

### **TDG FLAMMABILITY CLASSIFICATION**

Under the Canadian TDG Act and Regulations, chemicals are classified as flammable materials if they have certain properties. Consult the regulation for detailed information.

### **TDLO**

TDLO stands for lowest toxic dose tested (see also LDLO and LD50).

### **TERATOGEN, TERATOGENIC, TERATOGENICITY**

A teratogen is a substance which can cause birth defects. Teratogenic means able to cause birth defects. Teratogenicity is the ability of a chemical to cause birth defects. Teratogenicity results from a harmful effect to the embryo or the fetus/foetus.

The Canadian Controlled Products Regulations describe technical criteria for identifying materials which have teratogenicity and embryotoxicity. (See also Reproductive Effects.) Other jurisdictions may also have defined specific criteria.

Under the U.S. OSHA HAZCOM Standard, materials which have teratogenic effects are included under reproductive Target Organ Effects.

### **THERMAL DECOMPOSITION PRODUCTS**

Thermal decomposition products are chemicals which may be formed when the material is heated but does not burn. These chemicals may be toxic, flammable or have other hazards. The chemicals released and their amounts vary depending upon conditions such as the temperature. The thermal decomposition products may be quite different from the chemicals formed by burning the same material (hazardous combustion products). It is important to know which chemicals are formed by thermal decomposition because this information is used to plan ventilation requirements for processes where a material may be heated.

### **TLM**

TLM stands for Threshold Limit, median (aquatic toxicity rating).

### **TLV**

TLV stands for Threshold Limit Value. It is the occupational exposure limit established by the American Conference of Governmental Industrial Hygienists (ACGIH). TLV is a registered trademark of ACGIH. TLVs are adopted by some governments as their legal limits. (See Exposure Limits for a general explanation.)

### **TLV-C**

TLV-C stands for the ACGIH Threshold Limit Value-Ceiling. See also TLV.

### **TOC**

TOC stands for Tagliabue open cup; a standard method of determining flash points. Generally, this appears in abbreviated form as Tag open cup.

### **TOXIC, TOXICITY**

Toxic means able to cause harmful health effects. Toxicity is the ability of a substance to cause harmful health effects. Descriptions of toxicity (e.g. low, moderate, severe, etc.) depend on the amount needed to cause an effect or the severity of the effect.

Under the Canadian Controlled Products Regulations and the U.S. OSHA HAZCOM Standard, there are specific technical criteria for identifying a material as toxic for the purpose of each regulation. (See also Very Toxic and Highly Toxic.)

### **TRADE NAME**

A trade name is the name under which a product is commercially known. Some materials are sold under common

names, such as Stoddard solvent or degreaser, or internationally recognized trade names, like Varsol. Trade names are sometimes identified by symbols such as (R) or (TM).

#### **TSCA**

TSCA stands for Toxic Substances Control Act (U.S.).

#### **TWA**

TWA stands for Time-Weighted Average. (See Exposure Limits for a general explanation.)

#### **UEL**

See Explosive Limits.

#### **UFL**

See Explosive Limits.

#### **uG**

uG stands for microgram, a unit of mass.

#### **UN**

UN stands for United Nations. See also UN Number.

#### **UN NUMBER**

UN number stands for United Nations number. The UN number is a four-digit number assigned to a potentially hazardous material (such as gasoline, UN 1203) or class of materials (such as corrosive liquids, UN 1760). These numbers are used by firefighters and other emergency response personnel for identification of materials during transportation emergencies. UN (United Nations) numbers are internationally recognized. NA (North American) numbers are used only for shipments within Canada and the United States. PINs (Product Identification Numbers) are used in Canada. UN, NA and PIN numbers have the same uses.

#### **UNSTABLE (REACTIVE)**

Under the U.S. OSHA HAZCOM standard, a chemical is identified as unstable (reactive) if in the pure state, or as produced or transported, it will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure or temperature.

#### **UPPER EXPLOSION LIMIT**

See Explosive Limits.

#### **UPPER EXPLOSIVE LIMIT**

See Explosive Limits.

#### **UPPER FLAMMABLE LIMIT**

See Explosive Limits.

#### **USEPA**

See EPA.

#### **VAPOUR**

A vapour is the gaseous form of a material which is normally solid or liquid at room temperature and pressure. Evaporation is the process by which a liquid is changed into a vapour. Sublimation is the process by which a solid is changed directly into the vapour state.

#### **VAPOUR DENSITY**

Vapour density is the weight per unit volume of a pure gas or vapour. On an MSDS, the vapour density is commonly given as the ratio of the density of the gas or vapour to the density of air. The density of air is given a value of 1. Light gases (density less than 1) such as helium rise in air. If there is inadequate ventilation, heavy gases and vapours (density greater than 1) can accumulate in low-lying areas such as pits and along floors.

#### **VAPOUR PRESSURE**

Vapour pressure is a measure of the tendency of a material to form a vapour. The higher the vapour pressure, the higher the potential vapour concentration. In general, a material with a high vapour pressure is more likely to be an inhalation or fire hazard than a similar material with a lower vapour pressure.

#### **VENTILATION**

Ventilation is the movement of air. One of the main purposes of ventilation is to remove contaminated air from the workplace. There are several different kinds of ventilation. (See General Ventilation, Local Exhaust Ventilation, Mechanical Ventilation and Natural Ventilation.)

More detailed information is available in the CCOHS publication "A Basic Guide to Industrial Ventilation."

### **VERY TOXIC**

Under the Canadian Controlled Products Regulations, there are specific technical criteria for identifying a very toxic material. There are specific criteria for short-term lethality, long-term toxicity, teratogenicity and embryotoxicity, reproductive toxicity, carcinogenicity, respiratory sensitization and mutagenicity. (See also Toxic.) Under the US OSHA Hazcom Standard, the corresponding term is "highly toxic", which has a specific definition.

### **VOC**

VOC stands for volatile organic compound.

### **VOLATILE, VOLATILITY**

Volatile means a material can evaporate. Volatility is the ability of a material to evaporate. The term volatile is commonly understood to mean that a material evaporates easily.

On an MSDS, volatility is commonly expressed as the "% volatile." The percent volatile can vary from 0% (none of the material will evaporate) to 100% (all of the material will evaporate if given enough time).

If a product contains volatile ingredients, there may be a need for ventilation and other precautions to control vapour concentrations.

### **WATER REACTIVE**

Under the U.S. OSHA HAZCOM standard, a chemical is identified as water reactive if it reacts with water to release a gas that is either flammable or presents a health hazard.

### **WHMIS**

WHMIS stands for Workplace Hazardous Materials Information System. It is a Canadian program designed to protect workers by providing them and their employers with vital information about hazardous materials. The following are key features of WHMIS:

- Criteria to identify controlled products and to provide information about them in the workplace;
- A cautionary labelling system for containers of controlled products;
- Requirements for the disclosure of information by the use of material safety data sheets;
- Worker education programs;
- A mechanism to protect trade secrets.