Hazard Communication for Dangerous and Harmful Materials

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Outline

- Overview
- Basic rules on classification of chemical hazards
- Requirements on labeling format and contents
- Material Safety Data Sheet (MSDS)

What's in a sign?

- Have you ever seen signs like this?
- Where might you find such signs?
- What does the sign tell you?
- How can you handle the material safely?
- What would you do with the material in case of an emergency?

Outline

- **Overview**
  - **Definitions**
  - **Overview on hazard communication**
  - **Current regulatory requirement**
- Basic rules on classification of chemical hazards
- Requirements on labeling format and contents
- Material Safety Data Sheet (MSDS)

Definition of Hazard

Any source of potential damage, harm or adverse health effects on something or someone under certain conditions

- A hazard can cause harm or adverse effects to individuals as health effects, or to organizations as property or equipment losses

Workplace Hazards

Sources of potential hazards at a workplace. Five major types:

- Chemical hazards refer to harms and effects associated with specific chemical substances
- Physical hazards refer to various forms of excess energy or forces
- Biological hazards are associated with contact to other species or their derivatives (byproducts, metabolites, etc.)

Workplace Hazards (2)

Sources of potential hazards at a workplace. Five major types:

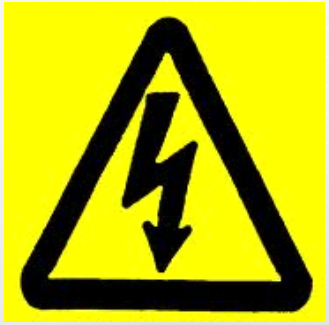
- Ergonomic hazards refer to factors related to the design of task, work area or tools, etc.
- Safety hazards may lead to serious injury or death, and may also cause property damage

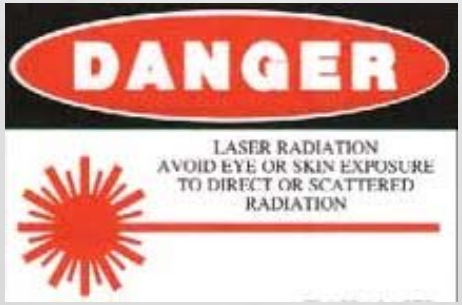
Definition of Hazard Communication

Communication on potential hazards

- Workplace hazards may be better controlled or prevented with increased awareness and protective measures
- Major contents in hazard communication
  - Characteristics of potential hazards
  - Prevention and control measures
  - Emergency response procedures

Hazard Communication May be Used in Many Types of Work Environment





In this session, we will focus on hazard communication for **chemicals** only

Regulatory Requirements on Hazard Communication

Based on "Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials" promulgated under Labor Safety and Health Law

- Three major components
  - Chemical classification
  - Labeling requirements
  - Communication measures

Regulatory History

Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials (Taiwan)

- Promulgated by Council of Labor
- First enacted on Dec. 28, 1992
- First revised June 29, 1999
- Current version promulgated on October 19, 2007 and was in effect after December 31, 2008

Regulation Structure

Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials

- Chapter 1: General provisions
- Chapter 2: **Labelling**
- Chapter 3: **Communication measures**
- Chapter 4: Supplementary provisions

Labeling and Hazard Communication

- Hazard Labeling
  - Graphic presentation and text messages according to major hazards
- Material Safety Data Sheet (MSDS)
  - Provides information on chemical hazards and safety recommendations
- Most of the labeling and communication requirements now follow the **GHS** guidelines

Global Harmonization System (GHS) of Classification and Labeling of Chemicals

- General guideline on chemical hazard classification labeling
  - Internationally harmonized system on **hazard classification**
  - Uniform format on hazard identification and safety message
  - Uniform format on hazard information and recommended safety measures

Outline

- Overview
- **Basic rules on classification of chemical hazards**
  - **GHS classification**
  - **Regulatory definitions**
- Requirements on labeling format and contents
- Material Safety Data Sheet (MSDS)

GHS Classification for Chemical Hazards

29 GHS hazard classes (updated 2009)

- Classification based on primary hazards and physical state of the chemical (solid, liquid or gas).
- Two or more categories are given within each hazard class
- The hazards classes are also characterized into three major groups:
  - Physical hazards
  - Health hazards
  - Environmental hazards

GHS Classification for Physical Hazards

- Under certain circumstances, the materials may cause fire, explosion, (strong) chemical reaction, or metal corrosion
  - May cause property damage and serious injury or death to individuals ➔ safety hazards
  - Sixteen classes: explosive, flammable, gases under pressure, reactive, oxidative, self-reactive, pyrophoric, self-heating, flammable in contact with water, organic peroxides, corrosive to metal

GHS Classification for Health & Environmental Hazards

- Chemicals may cause significant health effects to exposed individuals
  - Effect may not occur upon exposure
  - Eleven classes: acute toxicity, corrosive (to body tissues), irritant, allergic, mutagenic to reproductive cells, organ-specific toxicity, carcinogenic, reproductive hazards
- GHS classification for environmental hazards
  - Hazard on the environment (may be eventually hazardous to human)
  - Two classes: hazards to species in the aquatic environment (acute or chronic effects), and hazardous to ozone layer

Regulatory Classifications for Chemical Hazards

- Current GHS guideline defines 29 classes of physical, health, and environmental hazards
- Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials applies primarily to chemicals with **physical** and **health** hazards
  - Listed chemicals
  - Materials with physical or chemical properties described in the regulation

Dangerous vs. Harmful Materials

- Primarily refer to the physical and health hazard classified under the GHS guideline
  - **Dangerous** materials indicate potential physical hazards
  - **Harmful** materials indicate potential health hazards
  - Various materials are exempted from this regulation

Dangerous Materials

- Potential hazards likely to cause immediate danger
  - Fire, explosion or corrosion
  - Listed chemicals and substances of certain physical/chemical properties
- Six groups
  - Explosive material
  - Ignitable material
  - Oxidizing material
  - Flammable liquid
  - Flammable gas
  - Corrosive material

Harmful Materials

- Chemicals with potential health hazards to human body
  - Health hazards **may** occur only after **actual contact** with the substance
- Three major groups
  - 55 organic solvents
  - 62 special hazardous chemicals
  - 254 designated chemicals
- Also applies to chemicals regulated under Labor Safety and Health Law and CNS 15030 (National Standards for chemical classification and Labeling)

Exempted Materials

Not regulated under hazard communication

- Hazardous wastes
- Tobacco or tobacco products
- Food, beverages, drugs, cosmetics
- Articles (ready-made products)
- General domestic consumer products not for industrial uses
- Fire extinguishers
- Intermediate products undergoing chemical reactions in reactors or processes
- “Others designated by the central government” (specified otherwise)

Summary for Hazard Classification

- GHS classifications
  - 29 classes
  - Physical, chemical and environmental hazards
  - Additional categories within each class
- Labelling and hazard communication regulation
  - Dangerous vs. harmful materials
  - Regulated vs. exempted materials

Outline

- Overview
- Global Harmonization System (GHS)
- Basic rules on classification and graphic displays of chemical hazards
- **Requirements on labeling format and contents**
  - **Hazard labeling requirements**
  - **Hazard pictogram**
  - **Hazard labeling contents**
- Material Safety Data Sheet (MSDS)

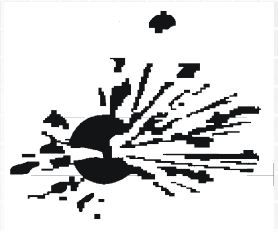
Hazard Labeling Requirements

- Current regulatory requirements on hazard labeling follows the GHS format and include
  - Pictograms for major hazards
  - Name of substance (or ingredient)
  - Signal word
  - Hazard statements
  - Precautionary statements
  - Supplier identification

Pictograms for Chemical Hazards

- Nine pictograms representing different chemical hazards
  - Explosive, flammable, oxidative, pressurized gas, corrosive, toxic, health hazard, environmental hazard
  - Depending on the category within each hazard class, different pictograms may be assigned

Explosives



Substance with potential explosion hazards. May belong to one of the GHS classes

- Explosive substances
- Some organic peroxides
- Self-reactive substances (prone to explosion during reaction)

Flammable Substances

Prone to cause fire

- Flammable gases, liquids, solids
- Self-reactive substances (may cause fire during reaction)
- Pyrophoric liquids, solids
- Self-heating substances
- Substances, when in contact with water, emit flammable gases
- Organic peroxide

Oxidizing substances

- Oxidizing solids, gases, solids

Pressurized gas

- Gas under pressure, liquefied gas, refrigerated gas, dissolved gas
- Pressurized container may present explosion hazard under heat, or may cause cryogenic injuries (refrigerated gas)

Corrosive substances

- Corrosive to metal — Safety hazard
- Corrosive to skin
- Serious eye damage (corrosive to eye)

Health hazard

Toxic Substances

- Acute toxicity

Chemical with Environmental Hazards

- Acute or long-term hazards to species living in the aquatic environment
- Hazard to the ozone layer

Chemicals with Health Hazards

Two symbols for health hazards

- Respiratory sensitizer
- Mutagenic to reproductive cells
- Carcinogenic substances
- Reproductive toxicity
- Toxicity to target organ from single or long-term exposure
- Aspiration hazards

- Acute toxicity
- Irritatant to skin, eye
- Skin sensitizer

Less severe health effects

Pictograms for Chemical Hazards

Physical hazards

Health hazards

Environmental hazards

Not all chemical hazards are assigned pictograms; some chemicals have more than one pictogram

Other GHS Label Elements

- Signal word
  - Single-word identifier for hazard
  - “Danger” or “warning”
- Hazard statement
  - Specifies types of hazard and conditions potentially leading to hazard
  - Set phrases with hazard category

Other GHS Label Elements (2)

- Precautionary statement
  - Summarizes information on safe handling and storage of the substance
- Supplier identification
  - Lists name, address and phone number of chemical manufacturer or supplier

Labeling for Chemical Hazards

- For dangerous and harmful materials, a hazard label is required outside of the container/package, outside the primary storage area, and nearby major area of usage
  - Pictograms must be displayed whenever applicable
  - For shipping packages, additional requirements must also be met on transportation labeling

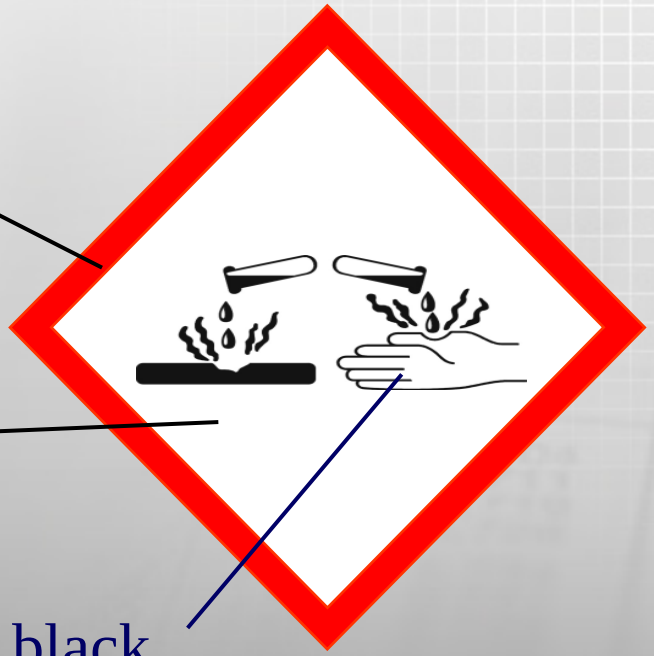
Sign Posting for Chemical Hazards

- Outside of major storage and handling area at locations that may be easily noticed

Diamond shape,
min. 10 cm × 10 cm

White background
with red border

Hazard pictogram in black



Some Notes on Labeling for Chemical Hazard

- Whenever space permitted, complete labels should be used
- Always refer to material safety data sheet (MSDS) for further information

Example of Chemical Hazard Label

Chemical/ingredient name

Hazard pictograms

Signal word: “Danger” or “Warning”

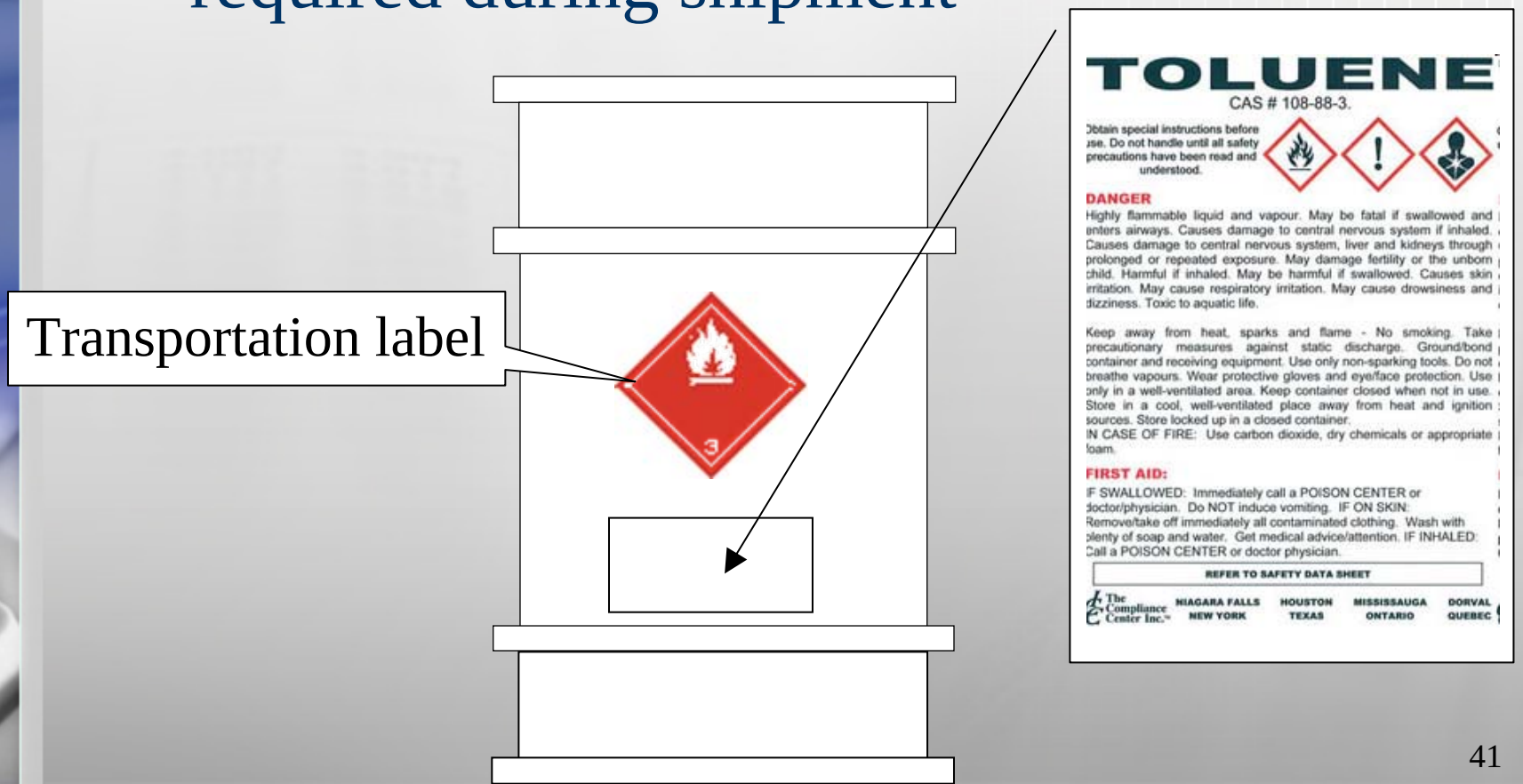
Hazard statements

Precautionary statements

Supplier identification

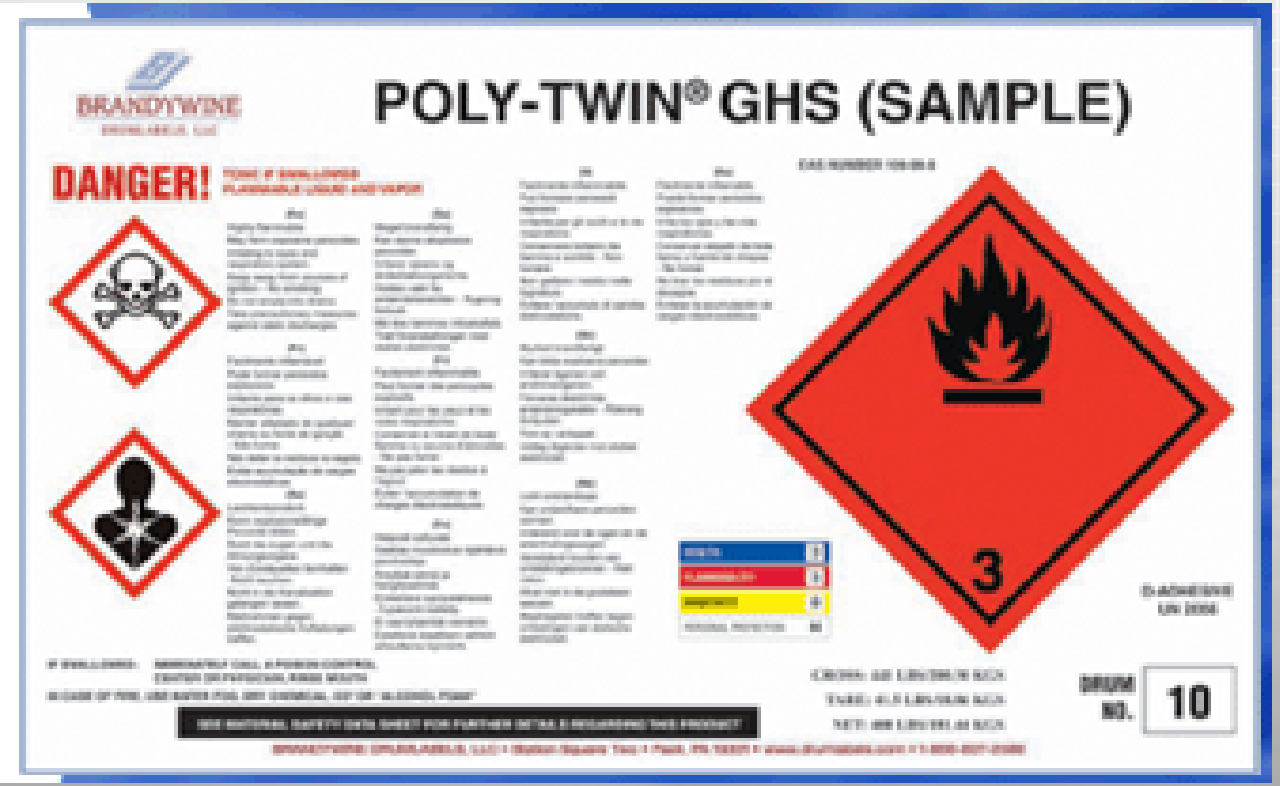
Example of Chemical Hazard Label (2)

- Additional transportation label may be required during shipment



Example of Chemical Hazard Label (3)

- In some cases, the transportation label may be added directly into a GHS label



Labeling for Chemical Hazards-- Summary

Minimum labeling requirement for small containers (< 100 mL)

- Basic elements
  - Pictograms for major hazards
  - Name of substance (ingredient)
  - Signal word
  - Hazard statements
  - Precautionary statements
  - Supplier identification
- Always refer to Material Safety Data Sheet (MSDS) for further information.

Hazard pictograms

Flammable	Oxidizing	Explosive
		
Corrosive	Pressurized gas	Acute toxicity
		
Health hazard	Health hazard	Environmental hazard
		

Outline

- Overview
- Global Harmonization System (GHS)
- Basic rules on classification and graphic displays of chemical hazards
- Requirements on labeling format and contents
- **Material Safety Data Sheet (MSDS)**
  - **Purpose of MSDS**
  - **Major contents**

Material Safety Data Sheet

- Provides detailed safety information on potential hazards, emergency response procedures, safe storage, handling and disposal of the chemical
- Current requirements also follow GHS specifications for safety data sheet (SDS)

MSDS Contains 16 Sections

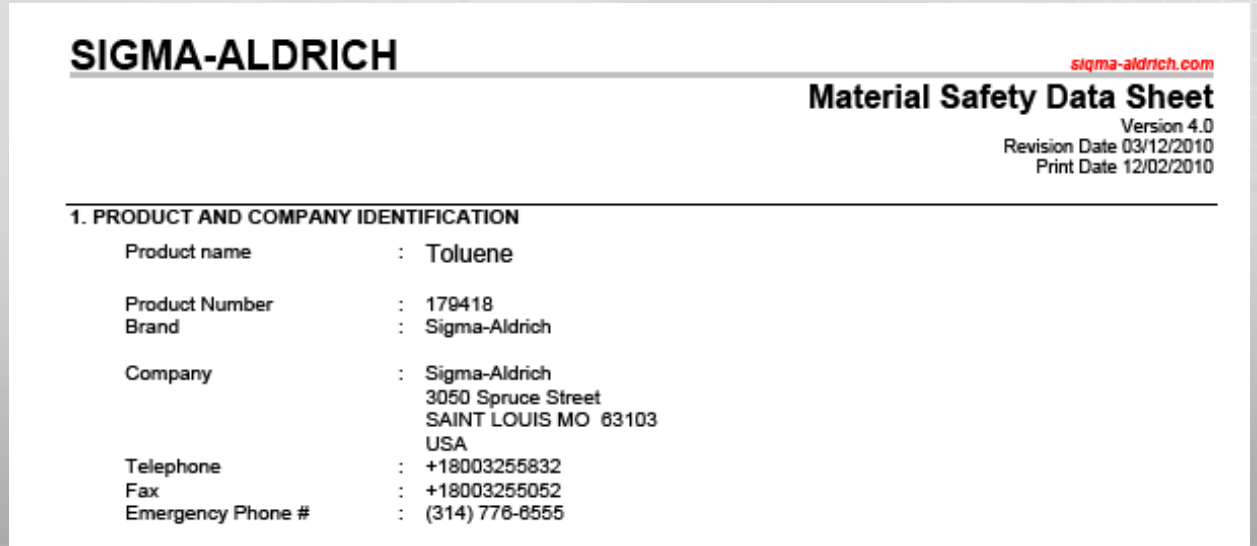
1. Product and Company identification
2. Hazard identification
3. Composition/ingredient
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and Storage
8. Exposure control/personal protection

A Complete SDS Contains 16 Sections

9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

Basic Elements in MSDS

1. Product and company identification
   - Product information (product name, suggested usage,
   - Producer's name, address, phone number, fax number, and emergency phone number.



SIGMA-ALDRICH sigma-aldrich.com

Material Safety Data Sheet

Version 4.0
Revision Date 03/12/2010
Print Date 12/02/2010

1. PRODUCT AND COMPANY IDENTIFICATION

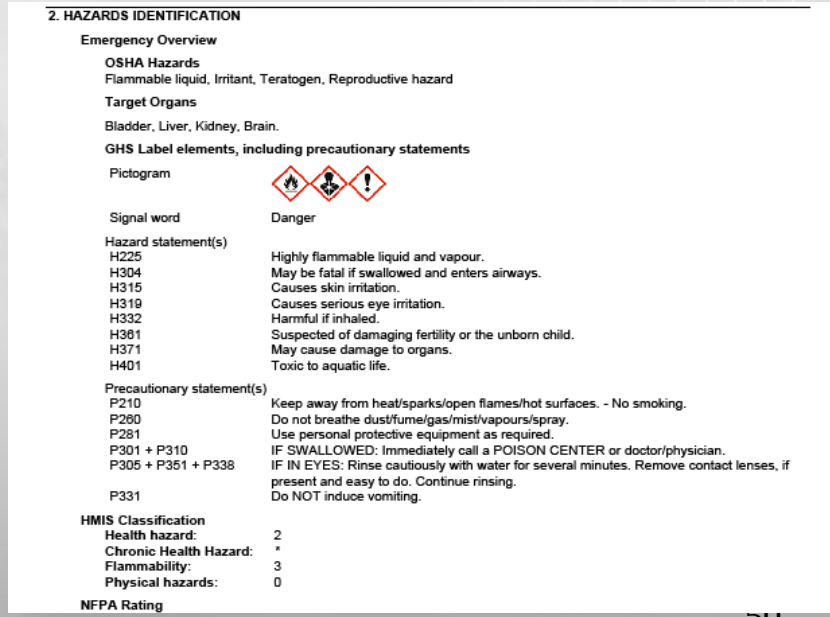
Product name	:	Toluene
Product Number	:	179418
Brand	:	Sigma-Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

Basic Elements in MSDS (2)

2. Hazard identification

Provides detailed information on

- major safety and health hazards
- GHS label elements (pictogram, signal word, hazard statement, precautionary statement
- Hazard classification by other systems
- Potential health effects



2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Irritant, Teratogen, Reproductive hazard

Target Organs

Bladder, Liver, Kidney, Brain.

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H371	May cause damage to organs.
H401	Toxic to aquatic life.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P281	Use personal protective equipment as required.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Basic Elements in MSDS (3)

3. Composition/Information on ingredient
   - Lists formula and molecular weight of hazardous substance, chemical identification number (CAS-, EC- and Index number)
   - If in mixture, indicate percent composition
4. First-aid measures
   - Provides information on initial care by an untrained individual under various conditions
   - Summarizes typical symptoms and first-aid procedures, and needs of medical treatment

Basic Elements in MSDS (4)

5. Fire-fighting measures
   - Lists suitable fire-extinguishing media,
   - Specifies possible hazards arising from the fire
   - Specifies protective measures for fire fighters
6. Accidental release measures
   - Measures to be taken in response to spills, leaks, or releases in order to minimize adverse effect to persons, properties and the environment
   - Also provides information on personal protection, and containment and clean up methods

Basic Elements in MSDS (5)

7. Handling and storage
   - Provides advice for safe handing process
   - Advice on general hygiene practice (e.g., “eating, drinking and smoking in work areas is prohibited”
   - Storage requirement, including note on incompatible substances
8. Exposure control/personal protection
   - Recommendation on engineering control and personal protective equipments to minimize occupational exposure

Basic Elements in MSDS (6)

9. Physical and chemical properties
   - Describes basic characteristics, including physical state, color, odor, pH, melting point, boiling point, flash point, solubility, partition coefficient, etc.
10. Stability and reactivity
   - Describes reactivity and stability, possible hazardous reactions, incompatible materials, and hazardous decomposition products from use, storage and heating.

Basic Elements in MSDS (7)

11. Toxicological information
    - Summarizes relevant toxicological data, including acute toxicity, skin corrosion and/or irritation, serious eye damage and/or irritation, carcinogenecity, etc.
    - Effects associated with different routes of exposure
    - Symptoms related to physical, chemical and toxicological characteristics
    - Immediate, delayed and chronic effects
    - Potential interactive effects

Basic Elements in MSDS (8)

12. Ecological information
    - Provides information to evaluate the environmental impacts, including toxicity to organisms, persistence and degradability, bioaccumulative potential, mobility in soil, and other adverse effects
13. Disposal considerations
    - Provides information for proper recycling or reclamation, selection of disposal containers and methods, factors that may affect disposal options, and precautions for incineration or landfill

Basic Elements in MSDS (9)

14. Transport information
    - Provides classification and information on UN transportation requirements.
15. Regulatory information
    - Lists applicable safety, health and environmental regulations specific for the product
16. Other information
    - Information on preparation of the MSDS, date of last revision, list of abbreviations, key literature references and sources of data

Hazard Communication for Dangerous and Harmful Materials

- Overview:
  - Definition of hazard and hazard communication
- Basic rules on classification of chemical hazards
  - GHS classification
  - Dangerous vs. harmful materials

Hazard Communication for Dangerous and Harmful Materials

- Requirements on labeling format and contents
  - Elements of GHS labels
  - Regulatory requirements on hazard labeling
- Material Safety Data Sheet (MSDS)
  - GHS structure and format

For Further Information

- Regulation on labeling and hazard communicaiton for dangerous and harmful materials

  http://www.iosh.gov.tw/Law/LawPublish.aspx?LID=111

- Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

  http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html

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