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Chapter 5: Basic Understanding about GHS (Globally Harmonized System of Classification and Labelling of Chemicals)

Objectives

- This chapter will explain additional knowledge concerning the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), a newly implemented system by United Nations.
- The detailed explanation about GHS including its Objective, Basic Principles, Key Elements will be explained.
- GHS Hazard Classification system which classify chemicals into 3 major hazards (physical/health/environmental hazards) will be discussed.
- GHS Hazard Communication will be highlighted in terms of both requirements on Labels and Safety Data Sheet (SDS).
- This chapter will also guide how the GHS will be applied together with the UN DG labels on packaging of chemicals as well as dangerous goods in terms of both single and combination packaging.
- The concept of Chemical Risk Assessment and Management will be further elaborated how GHS will be concerned in the future.

1. Introduction

1.1 Introduction about GHS

Chemicals, through the different steps from their production to their handling, transport and use, are a real danger for human health and the environment. People of any ages, from children to elderly, using many different languages and alphabets, belonging to various social conditions, including illiterates, are daily confronted to dangerous products (chemicals, pesticides, etc.).

To face this danger, and given the reality of the extensive global trade in chemicals and the need to develop national programs to ensure their safe use, transport and disposal, it was recognized that an internationally-harmonized approach to classification and labelling would provide the foundation for such programs. Once countries have consistent and appropriate information on the chemicals they import or produce in their own countries, the infrastructure to control chemical exposures and protect people and the environment can be established in a comprehensive manner.

The new system, which was called "Globally Harmonized System of Classification and Labelling of Chemicals (GHS)", addresses classification of chemicals by types of hazard and proposes harmonized hazard communication elements, including labels and safety data sheets. It aims at ensuring that information on physical hazards and toxicity from chemicals be available in order to enhance the protection

of human health and the environment during the handling, transport and use of these chemicals. The GHS also provides a basis for harmonization of rules and regulations on chemicals at national, regional and worldwide level, an important factor also for trade facilitation.

While governments, regional institutions and international organizations are the primary audiences for the GHS, it also contains sufficient context and guidance for those in industry who will ultimately be implementing the requirements which have been adopted.

The first edition of the GHS, which was intended to serve as the initial basis for the global implementation of the system, was adopted in December 2002 and published in 2003.

Since then, the GHS has been updated, revised and improved every two years as needs arise and experience is gained in its implementation:

GHS Rev.1 (2005): including, inter alia, various revised provisions concerning classification and labelling, new provisions for aspiration hazards and new guidance on the use of precautionary statements and pictograms and on the preparation of safety data sheets.

GHS Rev.2 (2007): including, inter alia, new and revised provisions concerning the classification and labelling of explosives; respiratory and skin sensitizers; toxic by inhalation gases and gas mixtures; additional guidance on the interpretation of the building block approach and on the evaluation of the carcinogenic potential of chemicals; and the codification of hazard and precautionary statements.

GHS Rev.3 (2009): including, inter alia, new provisions for the allocation of hazard statements and for the labelling of small packagings; two new sub-categories for respiratory and skin sensitization; the revision of the classification criteria for long-term hazards (chronic toxicity) to the aquatic environment; and a new hazard class for substances and mixtures hazardous to the ozone layer.

GHS Rev.4 (2011): including, inter alia, new hazard categories for chemically unstable gases and non-flammable aerosols; further rationalization of precautionary statements and further clarification of some of the criteria to avoid differences in their interpretation.

GHS Rev.5 (2013): including, inter alia, a new test method for oxidizing solids, miscellaneous provisions intended to further clarify the criteria for some hazard classes (skin corrosion/irritation, severe eye damage/irritation, and aerosols) and to complement the information to be included in the Safety Data Sheet; revised and simplified classification and labelling summary tables; a new codification system for hazard pictograms, and revised and further rationalized precautionary statements.

The System is now ready for worldwide implementation. In its Plan of Implementation (para 22.(c)) adopted in Johannesburg on 4 September 2002, the World Summit on Sustainable Development (WSSD) encouraged countries to implement the new GHS as soon as possible.

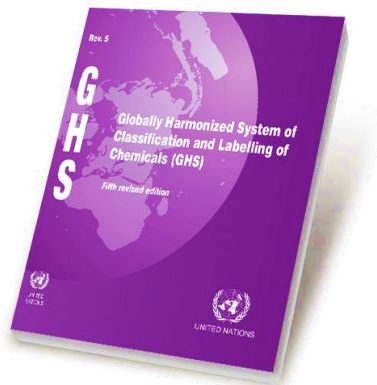


Figure 5-1: Globally Harmonized System of Classification and Labelling of Chemicals (GHS) 5th Revised Edition (2013)

1.2 Purpose, Scope and Application of GHS

Globally Harmonized System of Classification and Labelling of Chemicals (GHS) is a common and coherent approach to define and classify hazards and to communicate information on labels and Safety Data Sheets (SDS), which is previously in the past called under the term of Material Safety Data Sheet (MSDS).

The GHS includes the following elements:

- (a) harmonized criteria for classifying substances and mixtures according to their physical, health, and environmental hazards.
- (b) harmonized hazard communication elements, including requirements for labelling and safety data sheets.

Application of GHS covers all hazardous chemical substances, dilute solutions and mixtures. Pharmaceuticals, food additives, cosmetics and pesticide residues in food will not be covered by the GHS in terms of labelling at the point of intake. However these types of chemicals will be covered where workers may be exposed, and, in transport if potential exposure warrants.

It is anticipated that when implemented, the GHS will

- (a) enhance the protection of human health and the environment by providing an internationally comprehensive system for hazard communication;
- (b) provide a recognized framework for those countries without an existing system;
- (c) reduce the need for testing and evaluation of chemicals; and
- (d) facilitate international trade in chemicals whose hazards have been properly assessed and identified on an international basis.

1.3 Basic Principles of GHS

GHS is a globally harmonized system which comprises of 2 core elements

1. Hazard Classification. GHS classifies chemical hazards into 3 major hazards (physical hazards, health hazards and environmental hazards). These specific types of hazards are further sub-classified into minor hazard classes. For example, physical hazards compose of 16 hazard classes. Health hazards and environmental hazards compose of 10 and 2 hazard classes respectively. Each of hazard class is also classified into hazard categories (or may be sometimes called as divisions or type depending on the particular hazard classes).

| 2. Physical Hazards | GHS Recommendation Hazard Classes | | | | | | |
|--|-----------------------------------|---------------|----------------------------|---------------|--------------|--------------|--------------|
| 2.1 Explosives | Unstable Explosives | Division 1.1 | Division 1.2 | Division 1.3 | Division 1.4 | Division 1.5 | Division 1.6 |
| 2.2 Flammable gases | Category 1 | Category 2 | | | | | |
| 2.3 Flammable aerosols | Category 1 | Category 2 | | | | | |
| 2.4 Oxidizing gases | Category 1 | | | | | | |
| 2.5 Gases under pressure | Compressed gas | Liquefied gas | Refrigerated liquefied gas | Dissolved gas | | | |
| 2.6 Flammable liquids | Category 1 | Category 2 | Category 3 | Category 4 | | | |
| 2.7 Flammable solids | Category 1 | Category 2 | | | | | |
| 2.8 Self-reactive substances and mixtures | Type A | Type B | Type C | Type D | Type E | Type F | Type G |
| 2.9 Pyrophoric liquids | Category 1 | | | | | | |
| 2.10 Pyrophoric solids | Category 1 | | | | | | |
| 2.11 Self-heating substances and mixtures | Category 1 | Category 2 | | | | | |
| 2.12 Substances and mixtures which in contact with water emits flammable gases | Category 1 | Category 2 | Category 3 | | | | |
| 2.13 Oxidizing liquids | Category 1 | Category 2 | Category 3 | | | | |
| 2.14 Oxidizing solids | Category 1 | Category 2 | Category 3 | | | | |
| 2.15 Organic peroxides | Type A | Type B | Type C | Type D | Type E | Type F | Type G |
| 2.16 Corrosive to metals | Category 1 | | | | | | |

Figure 5-2: Hazard Classification – 16 Hazard Classes of Physical Hazards (Data prepared based on GHS 3rd Revised Edition)

| 3. Health Hazards | GHS Recommendation Hazard Classes | | | | |
|---|-----------------------------------|-------------|-------------|--|------------|
| 3.1 Acute Toxicity | Category 1 | Category 2 | Category 3 | Category 4 | Category 5 |
| 3.2 Skin Corrosion/Irritation | Category 1A | Category 1B | Category 1C | Category 2 | Category 3 |
| 3.3 Serious eye damage/eye irritation | Category 1 | Category 2A | Category 2B | | |
| 3.4 Respiratory or skin sensitization | Category 1 | Category 1A | Category 1B | | |
| 3.5 Germ cell mutagenicity | Category 1A | Category 1B | Category 2 | | |
| 3.6 Carcinogenicity | Category 1A | Category 1B | Category 2 | | |
| 3.7 Reproductive toxicity | Category 1A | Category 1B | Category 2 | Addtl Category (affects via lactation) | |
| 3.8 Specific target organ toxicity - Single exposure) | Category 1 | Category 2 | Category 3 | | |
| 3.9 Specific target organ toxicity - Repeated exposure) | Category 1 | Category 2 | | | |
| 3.10 Aspiration hazard | Category 1 | Category 2 | | | |
| 4. Environmental Hazards | GHS Recommendation Hazard Classes | | | | |
| 4.1 Hazardous to the aquatic environment - Acute toxicity | Category 1 | Category 2 | Category 3 | | |
| - Chronic toxicity | Category 1 | Category 2 | Category 3 | Category 4 | |
| 4.2 Hazardous to the ozone layer | Category 1 | | | | |

Figure 5-3: Hazard Classification – 10 Hazard Classes of Health Hazards and 2 Hazard Classes of Environmental Hazards (Data prepared based on GHS 3rd Revised Edition)

Building Block under GHS.

Countries are free to determine which of the building blocks will be applied in different parts of their systems.

- (a) Hazard Classes are building blocks.
- (b) Within hazard classes, each hazard category can be seen as a building block.
- (c) The classification criteria (cut-off values/concentration limits) for adopted hazard categories should not be altered.

When a hazard category is adopted, all the categories for higher hazard levels in that class must be adopted.

| Hazard class | Hazard category | GHS | | E U CLP Reg. | USA Rev. HCS | Japan JIS Z 7253 | MY DOSH | SG SS 586 | VN MolT Circ. | TH MOI Notice | ID MOI Guide | AU WHSR |
|--|----------------------------|-----------------------------|-----------------------------|--------------------|--------------------|------------------------|------------|--------------|---------------------|---------------------|--------------------|------------|
| | | 3 rd Rev. ed. | 4 th Rev. ed. | | | | | | | | | |
| 1. Explosive | Unstable explosive | o | o | o | o | o | o | o | o | o | o | o |
| | Div.1.1 | o | o | o | o | o | o | o | o | o | o | o |
| | Div.1.2 | o | o | o | o | o | o | o | o | o | o | o |
| | Div.1.3 | o | o | o | o | o | o | o | o | o | o | o |
| | Div.1.4 | o | o | o | o | o | o | o | o | o | o | o |
| | Div.1.5 | o | o | o | o | o | o | o | o | o | o | o |
| 2. Flammable gases (including chemical unstable gases) | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | x |
| | Cat. A | | | | | | | | | | | |
| | Cat. B | | o | | | o | | | | | | |
| 3. Aerosols | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | | | | | o | | | | | | |
| 4. Oxidizing gases | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| 5. Oxidizing gases | Compressed gas | o | o | o | o | o | o | o | o | o | o | o |
| | Liquefied gas | o | o | o | o | o | o | o | o | o | o | o |
| | Refrigerated liquefied gas | o | o | o | o | o | o | o | o | o | o | o |
| | Dissolved gas | o | o | o | o | o | o | o | o | o | o | o |
| 6. Flammable liquids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 4 | o | o | x | o | o | x | x | o | o | o | o |
| 7. Flammable solids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| 8. Self-reactive substances and mixtures | Type A | o | o | o | o | o | o | o | o | o | o | o |
| | Type B | o | o | o | o | o | o | o | o | o | o | o |
| | Type C&D | o | o | o | o | o | o | o | o | o | o | o |
| | Type E&F | o | o | o | o | o | o | o | o | o | o | o |
| | Type G | o | o | o | o | o | o | o | o | o | o | o |
| 9. Pyrophoric liquids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| 10. Pyrophoric solids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| 11. Self-heating substances and mixtures | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| 12. Substances and mixtures which, in contact with water, emit flammable gases | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o | o | o | o |
| 13. Oxidizing liquids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o | o | o | o |
| 14. Oxidizing solids | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o | o | o | o |
| 15. Organic peroxides | Type A | o | o | o | o | o | o | o | o | o | o | o |
| | Type B | o | o | o | o | o | o | o | o | o | o | o |
| | Type C&D | o | o | o | o | o | o | o | o | o | o | o |
| | Type E&F | o | o | o | o | o | o | o | o | o | o | o |
| | Type G | o | o | o | o | o | o | o | o | o | o | o |
| 16. Corrosive to metals | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |

Figure 5-4: Building Blocks among Different Countries –Physical Hazards (Data prepared by Hiroshi Sano, Japan Chemical Database Ltd.)

| Hazard class | Hazard category | GHS | | E U CLP Reg. | USA Rev. HCS | Japan JIS Z 7253 | MY DOSH | SG SS 586 | VN MoIT Circ. | TH MOI Notice | ID MOI Guide | AU WHSR |
|---|-----------------|-----------------------------|-----------------------------|--------------------|--------------------|------------------------|------------|--------------|---------------------|---------------------|--------------------|------------|
| | | 3 rd Rev. ed. | 4 th Rev. ed. | | | | | | | | | |
| 1 Acute toxicity | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 4 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 5 | o | o | x | x | x | x | x | o | o | o | x |
| 2 Skin corrosion / irritation | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | x | x | x | x | x | o | o | o | x |
| 3 Serious eye damage / eye irritation | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2A | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2B | o | o | o | o | o | o | o | o | o | o | x |
| 4 Respiratory sensitization Serious eye damage eye irritation | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 1A | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 1B | o | o | o | o | o | o | o | o | o | o | o |
| 5 Germ cell mutagenicity | Cat. 1A | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 1B | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| 6 Carcinogenicity | Cat. 1A | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 1B | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| 7 Reproductive toxicity | Cat. 1A | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 1B | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Add. Cat. | o | o | o | o | o | o | o | o | o | o | o |
| 8 Specific target organ toxicity (single exposure) | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | o | o* | o | o | o |
| 9 Specific target organ toxicity (repeated exposure) | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| 10 Aspiration hazard | Cat. 1 | o | o | o | o | o | o | o | o* | o | o | o |
| | Cat. 2 | o | o | x | x | x | x | x | o* | o | o | x |
| Hazardous to the aquatic environment - acute hazard | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | x | o | o | x | x | o | o | o | o |
| | Cat. 3 | o | o | x | o | o | x | x | o | o | o | o |
| Hazardous to the aquatic Environment - long-term hazard | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 2 | o | o | o | o | o | o | o | o | o | o | o |
| | Cat. 3 | o | o | o | o | o | o | x | o | o | o | o |
| | Cat. 4 | o | o | o | o | o | o | x | o | o | o | o |
| Hazardous to the ozone layer | Cat. 1 | o | o | o | o | o | o | o | o | o | o | o |

Figure 5-5: Building Blocks among Different Countries – Health and Environmental Hazards (Data prepared by Hiroshi Sano, Japan Chemical Database Ltd.)

2. Hazard Communication. GHS requires the 2 basis components of hazard communication to be accomplished which are GHS label and GHS Safety Data Sheet (SDS). The primary target groups under GHS for hazard communication covers major 4 target audiences (workplace, consumers, transporters and emergency responders)

(a) GHS label

The information required on GHS label are:-

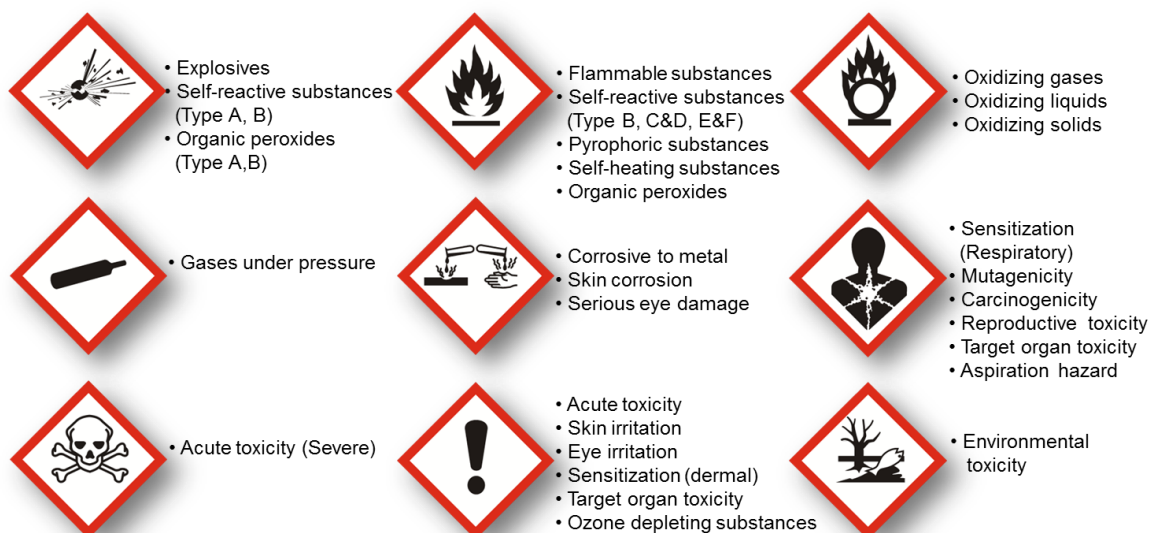
Pictograms (and/or symbols)

A pictogram means a graphical composition that may include a symbol plus other graphic elements such as a border, background patten or colour that is intended to convey specific information.

All hazard pictograms used in the GHS should be in the shape of a square set at a point.

Pictograms prescribed by the GHS should have a black symbol on a white background with a red frame sufficiently wide to be clearly visible. However when such a pictogram appears on a label for a package which will not be exported, the competent authority may choose to give suppliers and employers discretion to use a black border.

Pictograms prescribed by the GHS for sectors other than transport, and a code uniquely identifying each one, are listed in Section 4 of Annex 3. The pictogram code is intended to be used for reference purposes only. It is not part of the pictogram, and should not appear on labels or in section 2 of the safety data sheet.



Remark: Competent authority may choose to use a black border for domestic use

Figure 5-6: GHS Pictograms

Signal words

A signal word means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in the GHS are “Danger” and “Warning”. “Danger” is mostly used for more severe hazard categories (i.e. in the main for hazard categories 1 and 2), while “Warning” is mostly used for the less severe.

Hazard Statements

A hazard statement means a phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.

Hazard statements and a code uniquely identifying each one are listed in section 1 of Annex 3. The hazard statement code is intended to be used for reference purposes. It is not part of the hazard statement text and should not be used to replace it.

Precautionary statements and pictograms

A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. The GHS label should include appropriate precautionary information, the choice of which is with the labeller or the competent authority.

Precautionary statements and a code uniquely identifying each one are listed in section 2 of annex 3. The precautionary is intended to be used for reference purposes. It is not part of the precautionary statement text and should not be used to replace it.

Product Identifier

A product identifier should be used on a GHS label and it should match the product identifier used on the SDS. Where a substance or mixture is covered by the *UN Model Regulations on the Transport of Dangerous Goods*, the UN proper shipping name should be also used on the package;

The label for a substance should include the chemical identity of the substance. For mixtures, the label should include the chemical identities of all ingredients that contribute to the health hazards.

Supplier identification

The name, address and telephone number of the manufacturer or supplier of the substance and mixture should be provided on the label.

Precedence for the allocation of symbols and signal words

In workplace, the competent authority may require all symbols for physical hazards to be used. For health hazards the following principles of precedence apply:

- (a) if the skull and cross bones applies, the exclamation mark should not appear;
- (b) if the corrosive symbol applies, the exclamation mark should not appear where it is used for skin or eye irritation;
- (c) if the health hazard symbol appears for respiratory sensitisation, the exclamation mark should not appear where it is used for skin sensitisation or for skin or eye irritation.
- (d) if the signal word “Danger” applies, the signal word “Warning” should not appear.




| | | |
|--|--|--------------------------|
| Methanol 14kg | Methyl Alcohol CH3OH=32.04 CAS No. 65-56-1 UN No. 1230 | Product identifier |
|    | | Pictogram |
| DANGER | | Signal word |
| Hazard statements: •Highly flammable liquid and vapor •May be harmful if swallowed •Cause serious eye irritation •May damage fertility or the unborn child •Causes damage to organs (central nervous system, visual organ, systemic toxicity) •May cause respiratory irritation •May cause drowsiness and dizziness •Cause damage to organs (central nervous system, visual organ) through prolonged or repeated exposure | | Hazard statements |
| Precautionary statements: •Do not handle until all safety precautions have been read and understood. •Keep container tightly closed. •Keep away from heat/sparks/open flame – No smoking. •Wear protective gloves and eye/face protection. •Do not eat, drink or smoke when using this product. •Use only outdoors or in well ventilated area. •Wash thoroughly after handling. | | Precautionary statements |
| United Nations Co., Ltd. 1-1, Peace Ave., Geneva Switzerland Tel. 41 22 917 00 00 Fax. 41 22 917 00 00 | | Supplier identification |

Figure 5-7: An Example of GHS Label

(b) GHS Safety Data Sheet (SDS)

The GHS Safety Data Sheet (SDS) shall be produced under the 16 headings format as far as all substances and mixtures meeting the harmonized criteria for physical, health or environmental hazards under the GHS.

An SDS should be provided based on the general cut-off values and concentration limits in the figure below:-

| Hazard class | Cut-off value/concentration limit |
|--|---|
| Acute toxicity | ≥ 1.0% |
| Skin corrosion/Irritation | ≥ 1.0% |
| Serious eye damage/eye irritation | ≥ 1.0% |
| Respiratory/Skin sensitization | ≥ 0.1% |
| Germ cell mutagenicity (Category 1) | ≥ 0.1% |
| Germ cell mutagenicity (Category 2) | ≥ 1.0% |
| Carcinogenicity | ≥ 0.1% |
| Reproductive toxicity | ≥ 0.1% |
| Specific target organ toxicity (single exposure) | ≥ 1.0% |
| Specific target organ toxicity (repeated exposure) | ≥ 1.0% |
| Aspiration hazard (Category 1) | ≥ 10% of Category 1 ingredient(s) and kinematic viscosity ≤ 20.5 mm ² /s at 40°C |
| Aspiration hazard (Category 2) | ≥ 10% of Category 2 ingredient(s) and kinematic viscosity ≤ 14 mm ² /s at 40°C |
| Hazardous to the aquatic environment | ≥ 1.0% |

Figure 5-8: Cut-off values/concentration limits for each health and environmental hazards

SDS format

The information in the SDS should be presented using the following 16 headings in the order given below:

1. Identification
2. Hazard(s) identification
3. Composition/information on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal information
14. Transport information
15. Regulatory information
16. Other information

SDS Content

The basic minimum information required on SDS is as follows:-

| | | |
|---|--|--|
| 1 | Identification of the substance or mixture and of the supplier | <ul style="list-style-type: none"> • GHS product identifier • Other means of identification • Recommended use of the chemical and restrictions on use • Supplier's details (including name, address, phone number etc) • Emergency phone number. |
| 2 | Hazards identification | <ul style="list-style-type: none"> • GHS classification of the substance/mixture and any National or regional information • GHS label elements, including precautionary statements. Other hazards which do not result in classification or are not covered by the GHS. |
| 3 | Composition/information on ingredients | <p>Substance</p> <ul style="list-style-type: none"> • Chemical identity • Common name, synonyms, etc. • CAS number, other unique number etc. • Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. <p>Mixture</p> <ul style="list-style-type: none"> • The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels. |
| 4 | First aid measures | <ul style="list-style-type: none"> • Description of necessary measures, subdivided according to the different routes of exposure, i.e. inhalation, skin and eye contact and ingestion • Most important symptoms/effects, acute and delayed • Indication of immediate medical attention and special treatment needed, if necessary. |
| 5 | Fire-fighting measures | <ul style="list-style-type: none"> • Suitable (and unsuitable) extinguishing media • Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products) • Special protective equipment and precautions for firefighters. |
| 6 | Accidental release measures | <ul style="list-style-type: none"> • Personal precautions, protective equipment and emergency procedures • Environmental precautions • Methods and materials for containment and cleaning up |
| 7 | Handling and storage | <ul style="list-style-type: none"> • Precautions for safe handling • Conditions for safe storage, including any incompatibilities |
| 8 | Exposure controls/personal protection | <ul style="list-style-type: none"> • Control parameters e.g. occupational exposure limit values or biological limit values • Appropriate engineering controls • Individual protection measures, such as personal protective equipment. |
| 9 | Physical and chemical properties | <ul style="list-style-type: none"> • Appearance (physical state, colour etc) • Odour • Odour threshold • PH • Melting point/freezing point • Initial boiling point and boiling range • Flash point • Evaporation rate • Relative density • Flammability (solid, gas) • Upper/lower flammability or explosive limits • Vapour pressure • Vapour density • Solubility(ies) • Partition coefficient: n-octanol/water • Auto-ignition temperature • Decomposition temperature |

| | | |
|----|--|---|
| 10 | Stability and reactivity | <ul style="list-style-type: none"> • Chemical stability • Possibility of hazardous reactions • Conditions to avoid (e.g. static discharge, shock or vibration) • Incompatible materials • Hazardous decomposition products |
| 11 | Toxicological information | <ul style="list-style-type: none"> • Concise but complete and comprehensible description of the various toxicological (health) effects and the available data used to identify those effects, including: <ul style="list-style-type: none"> • Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact); • Symptoms related to the physical, chemical and toxicological characteristics; • Delayed and immediate effects and also chronic effects from short- and long-term exposure; • Numerical measures of toxicity (such as acute toxicity estimates). |
| 12 | Ecological information | <ul style="list-style-type: none"> • Ecotoxicity (aquatic and terrestrial, where available) • Persistence and degradability • Bioaccumulative potential • Mobility in soil • Other adverse effects |
| 13 | Disposal considerations | <ul style="list-style-type: none"> • Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging. |
| 14 | Transport information | <ul style="list-style-type: none"> • UN number. • UN Proper shipping name. • Transport Hazard class(es). • Packing group, if applicable. • Marine pollutant (Yes/No). • Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises. |
| 15 | Regulatory information | <ul style="list-style-type: none"> • Safety, health and environmental regulations specific for the product in question. |
| 16 | Other information including information on preparation and revision of the SDS | |

Figure 5-9: Content of GHS SDS

1.4 Basic Concept about Risk Assessment

The GHS is not intended to harmonize risk assessment procedures or risk management decisions (such as establishment of a permissible exposure limit for employee exposure), which generally require some risk assessment in addition to hazard classification.

Hazard vs Risk

Each hazard classification and communication system (workplace, consumer, transport) begins coverage with an assessment of the hazards posed by the chemical involved. The degree of its capacity to harm depends on its intrinsic properties, i.e. its capacity to interfere with normal biological processes and its capacity to burn, explode, corrode, etc. This is based primarily on a review of the scientific studies available. The concept of risk or the likelihood of harm occurring, and subsequently communication of that information, is introduced when exposure is considered in conjunction with the data regarding potential hazards. The basic approach to risk assessment is characterized by the simple formula:

$$\text{Hazard} \times \text{exposure} = \text{risk}$$

Thus if you can minimize either hazard or exposure, you minimize the risk or likelihood of harm. Successful hazard communication alerts the user to the presence of a hazard and the need to minimize exposures and the resulting risks.

All of the systems for conveying information (workplace, consumer, and transport) include both hazard and risk in some form. They vary in where and how they provide the information, and the level of detail they have regarding potential exposures. For example, exposure of the consumer to pharmaceuticals comprises a specific dose that is prescribed by the physician to address a certain condition. The exposure is intentional. Therefore, a determination has been made by a drug regulatory agency that for the consumer, an acceptable level of risk accompanies the specific dosage provided. Information that is provided to the person taking the pharmaceutical conveys the risks assessed by the drug regulatory agency rather than addressing the intrinsic hazards of the pharmaceutical or its components.

2. Conclusion

Established officially as a GHS purple book in the year 2003, GHS is a large scale of collaborative efforts for over decades around the world in order to harmonize the way the chemical industries classify and communicate the chemical hazards (for single substances, diluted solutions and mixtures). With this new approach, it is highly anticipated that the chemicals will be globally re-classified and communicated in a standardized way through the new formats of label and Safety Data Sheet (SDS).

Even though GHS is not mandatory, it is highly recommended by United Nations for countries to adopt and implement GHS. The implementation by many countries around the world has made a significant progress since the year 2006. In many regions, GHS has become the flagship issue with high priorities in terms of expert development, train-the-trainer programs and capacity building across the whole world.

It is still yet a long way to go for full implementation of GHS around the world. Nevertheless, the GHS purple book has been regularly updated every 2 years improving the necessary amendments and changes. In the future, GHS will be used as a baseline concept for chemical risk assessment which is much more advanced and complicated. Chemical industries will gradually be required to come up with scientific based approaches on chemical risk assessment and management in order to ensure that the human health and environment shall be safe from the use of chemicals.

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