D11_2

< Risk identification and safety>

Reading and Understanding Safety Data Sheets

IAMC Toolkit

Innovative approaches for the Sound Management of Chemicals and Chemical Waste

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Introduction

Chemicals present risks according to their proprieties. This presentation aims at providing information to understand how Hazard information on chemicals is communicated through safety data sheets (SDSs)

The reader will learn what information are provided in the standardized chemicals classifications and labelling according to chemical proprieties.

These information allow the reader understanding the chemical potential risk for people, environment and equipment.

Hazard Management

1. Risk identification and safety	2. Transport and storage	3. Fire and explosion protection	4. Emergency response
11. Chemical classification and labelling	21. Internal transport of chemicals	31. Fire protection	41. Emergency response plan
12. Risk assessment	22. Internal pedestrian routes	32. Fire protection in welding and cutting operations	
13. Safety rules	23. Storage	33. Explosion protection	
14. Personal protective equipment		34. Container cleaning	
15. Skin protection			
16. Emergency escape routes			
17. Handling of solvents, acids and bases			
18. Safety in gas tank handling			

Checklists

Contents

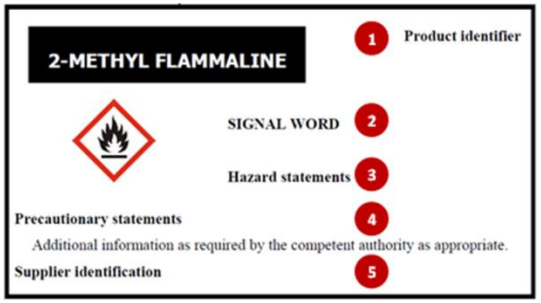
1. Introduction
2. GHS Safety Data Sheets
   - Overview of different elements
   - Examples

Introduction

GHS Hazard Communication

- Based on GHS classification criteria, the GHS hazard communication system was developed, including:

  - Labelling



Source: UN GHS, 2013

  - **<u>Safety Data Sheets (SDSs)</u>**

Source: ISSPPRO

Note: **MSDS=SDS**

GHS Safety Data Sheets

What is the GHS Safety Data Sheet (SDS)?

The SDS is a document that provides information on:

- Properties of hazardous chemicals (substances and mixtures)
- How they can affect health and safety in the workplace
- How to manage hazardous chemicals in the workplace

The SDS includes information on:

- The identity of a substance
- Physical-chemical hazards
- Storage, handling, transport and final disposal
- Safety instructions for workers
- Emergency procedures (e.g. fire fighting, first aid)

➢ **Based on this information, risk assessments are conducted and operating instructions for workplaces are developed.**

GHS – Safety Data Sheets

The minimum information in an SDS is provided in 16 sections:

1. Identification
2. Hazard(s) identification
3. Composition and ingredient information
4. First aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls and PPE
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. Any other relevant information

SDS: Section 1

- This section provides information about the identification of the hazardous chemical, recommended uses and the contact details of the manufacturer or importer, including an emergency contact.

Section 1: Identification

- Identification of the substance or mixture:
  - GHS identifier
  - Other unique identifiers
- Supplier's details:
  - Name, full address and phone number(s)
- Recommended use of the chemical and restrictions on use
- Emergency phone number

Example: SDS (Sections 1) for a Substance

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH)

Source: ISSPPRO

Version: 2 Language: EN Revision date: 14/11/2013

SECTION 1: Identification of the substance/mixture and of the Company/Undertaking

1.1. Product identifier

ortho-Xylol

Trade name:	ortho-Xylol
Synonyms:	o-xylol, o-xylene, ortho-xylene, o-dimethylbenzene, 1,2-dimethylbenzene, o-methyl toluene, 1,2-methyl toluene, 1,2-xylene
Chemical formula:	C_8H_{10}
CAS-number:	95-47-6
EC-number:	202-422-2
REACH registration number:	01-2119485822-30

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses of the substance/mixture:	manufacture of substances, distribution of substances, intermediate, formulation of preparations (mixtures), washing and cleaning products, coatings, mining (including offshore industries), binding agent, fuel, agrochemicals, laboratory chemicals, manufacture of plastics products.
Not recommended uses of the substance/mixture:	This product is not recommended for any industrial, professional or consumer use other than the identified uses above.

1.3. Details of the supplier of the Safety Data Sheet

Supplier
K.H. Klink Chemierohstoffe GmbH
Nauheimer Strasse 37
70372 Stuttgart
Germany

Telephone: 0049-711-55381-0
Fax: 0049-711-55381-30
E-mail (competent person): qm@khklink.de

1.4. Emergency telephone number

Information Centre for Intoxication Freiburg **Telephone:** ++49-(0)761 19240

Identification of the substance

Recommended use

Restrictions on use

Supplier details

Emergency phone number

SDS: Section 2

This section describes the hazards associated with a chemical and the appropriate warning information about these hazards.

Section 2: Hazard identification

- Classification of the substance or mixture
- GHS labelling elements: signal word, hazard statement(s) and precautionary statement(s)
- Other hazards which do not result in classification

IMPORTANT:

The information provided here must include GHS labelling elements:

- **Signal word**
- **Hazard statement(s)** (H-codes) explaining all the hazards of the hazardous chemical
- **Precautionary statement(s)** (P-codes) describing measures recommended to prevent or minimize adverse effects of exposure to or improper handling of a hazardous chemical

Example: SDS (Section 2) for a Substance

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

2.1.1. Classification according to Regulation (EC) No 1272/2008 (CLP)

Flam. Liq. 3; H226
Acute Tox. 4; H312
Skin Irrit. 2; H315
Acute Tox. 4; H332

2.1.2. Classification according to Directive 67/548/EEC and 1999/45/EC

R10
Xn; R20/21
Xi; R38

Identification of the substance

GHS labelling elements

Other hazards (not classified)

Source: ISSPPRO

2.1.3. Self classification(s)

According to Regulation (EC) No 1272/2008 (CLP):
Flam. Liq. 3; H226
Asp. Tox. 1; H304
Acute Tox. 4; H312
Skin Irrit. 2; H315
Eye Irrit. 2; H319
Acute Tox. 4; H332
STOT SE 3; H335

For full text of R-phrases and Hazard- and EU Hazard-statements: see section 16

2.2. Label elements

Labelling name: ortho-Xylol
EC-number: 202-422-2

2.2.1. Labelling according to Regulation (EC) No 1272/2008

Hazard pictograms:

GHS02 GHS07

Signal word:	Warning	
H phrases:	H226	Flammable liquid and vapour.
	H312	Harmful in contact with skin.
	H315	Causes skin irritation.
	H332	Harmful if inhaled.
P phrases:	P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
	P243	Take precautionary measures against static discharge.
	P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
	P332+P313	If skin irritation occurs: Get medical advice/attention.

2.3. Other hazards

Physical and chemical properties
This substance does not meet the criteria for classification as PBT or vPvB. Vapours are heavier than air and will spread at floor level. Vapours may form explosive mixtures with air. This material can accumulate static charge by flow or agitation and can be ignited by static discharge.

Health hazards
May be harmful if swallowed due to its low viscosity by entering the lungs; can cause damage to the lungs within short time (medical observation for at least 48 hours after exposure).

Example: SDS (Sections 1 and 2) for a Mixture

Safety Data Sheet
according to 1907/2006/EC, Article 31

Printing date 25.09.2014 Version number 4 Revision: 24.09.2014

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier
Trade name:

Testbenzin 145/200

Hydrocarbons, C9-C12, n-alkanes, isoalkanes, cyclics, aromatics (2-25%)

EC-/EINECS number: 919-446-0
Registration number: 01-2119458049-33

1.2. Relevant identified uses of the substance or mixture and uses advised against

Application of the substance / the mixture:
Solvent, manufacture of substance, distribution of substance, formulation & (re)packing of substances and mixtures, uses in coatings, use in cleaning agents, lubricants, metal working fluids / rolling oils, use as a fuel, lamp oil, barbecue lighter, functional fluids, road and construction applications, use in laboratories, plastic production and further processing, water treatment, drilling operations, use in agrochemicals. For further information on identified uses please refer to the Annex.

Uses advised against: Other uses than the identified uses indicated above.

1.3. Details of the supplier of the safety data sheet
Manufacturer/Supplier:
K.H. Klink Chemierohstoffe GmbH
Nauheimer Strasse 37
70372 Stuttgart
Germany

Telephone: 0049-711-55381-0
Fax: 0049-711-55381-30

Further information obtainable from: qm@khklink.de

1.4. Emergency telephone number:
Vergiftungs-Informations-Zentrale Freiburg, Germany
+49 (0)761 19240

Source: ISSPPRO

Example: SDS (Sections 1 and 2) for a Mixture

1

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008:

GHS02

Flam. Liq. 3 H226 Flammable liquid and vapour.

GHS08

STOT RE 1 H372 Causes damage to organs through prolonged or repeated exposure.

Asp. Tox. 1 H304 May be fatal if swallowed and enters airways.

2

GHS09

Aquatic Chronic 2 H411 Toxic to aquatic life with long lasting effects.

GHS07

STOT SE 3 H336 May cause drowsiness or dizziness.

EUH066

Classification according to Directive 67/548/EEC or Directive 1999/45/EC:

Xn; Harmful

R65-48/20: Harmful: may cause lung damage if swallowed. Danger of serious damage to health by prolonged exposure. Harmful by inhalation.

N; Dangerous for the environment

R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R10-66-67: Flammable. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness.

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008

The product is classified and labelled according to the CLP regulation.

Hazard pictograms:

GHS02 GHS07 GHS08 GHS09

Signal word: Danger

Hazard-determining components of labelling:

Hydrocarbons, C9-C12, n-alkanes, isoalkanes, cyclics, aromatics (2-25%)

EC-no.: 919-446-0

Hazard statements:

H226 Flammable liquid and vapour.
H336 May cause drowsiness or dizziness.
H372 Causes damage to organs through prolonged or repeated exposure.
H304 May be fatal if swallowed and enters airways.
H411 Toxic to aquatic life with long lasting effects.

(Contd. on page 3)

GB

3

Precautionary statements:

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P241	Use explosion-proof electrical/ventilating/lighting/equipment.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P240	Ground/bond container and receiving equipment.
P233	Keep container tightly closed.
P242	Use only non-sparking tools.
P273	Avoid release to the environment.
P243	Take precautionary measures against static discharge.
P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER/doctor if you feel unwell.
P331	Do NOT induce vomiting.
P370+P378	In case of fire: Use foam, water spray, dry chemical powder, CO_2 for extinction.
P391	Collect spillage.
P405	Store locked up.
P403+P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/container in accordance with local/regional/national/international regulations.

Additional information:

EUH066 Repeated exposure may cause skin dryness or cracking.

2.3. Other hazards

Flammable liquid and vapour.
Take precautionary measures against static discharge.
Vapours may form explosive mixtures with air.
Vapours are heavier than air and will spread at floor level.
Vapours may cause drowsiness and dizziness.
Repeated exposure may cause skin dryness or cracking.
May irritate the eyes and the respiratory system.
Target organ: central nervous system (CNS)

Source: ISSPPRO

not be copied, transmitted or manipulated

SDS: Section 3

Section 3: Composition/Information on ingredients

Substances:

- Chemical identity
- Common name, synonym of the substance
- CAS number and other unique identifiers
- Impurities and stabilizing additives

Mixtures (for all hazardous ingredients):

- Chemical identity
- Identification number
- Concentration range

SDS: Sections 4 and 5

Section 4: First-aid measures

- Description
- Most important symptoms/effects, acute and delayed
- If needed, indication of:
  - Immediate medical attention
  - Special treatment

Section 5: Fire-fighting measures

- Suitable extinguishing media
- Specific hazards arising from the chemical
- Special protective equipment and precautions for fire-fighters

SDS: Sections 6 and 7

Section 6: Accidental release measures

- Personal precautions, protective equipment and emergency procedures
- Environmental precautions
- Methods and materials for containment and cleaning up

Section 7: Handling and storage

- Precautions for safe handling
- Conditions for safe storage (including incompatibilities)

Section 8

Section 8: Exposure controls/personal protection

- Control parameters (national occupational exposure limit values)
- Appropriate engineering controls
- Individual protection measures, including personal protective equipment (PPE)

SDS: Section 9

Section 9: Physical and chemical properties

- Appearance
- Odour
- Odour threshold
- pH
- Melting point/freezing point
- Initial boiling point and boiling range
- Flash point
- Evaporation rate
- Flammability (solid, gas)
- Upper/lower flammability or explosive limit
- Vapour pressure
- Vapour density
- Relative density
- Solubility(ies)
- Partition coeficient n-octanol/water
- Auto-ignition temperature
- Decomposition temperature
- Viscosity

SDS: Section 10

Section 10: Stability and reactivity

- Reactivity
- Chemical stability
- Possibility of hazardous reactions
- Conditions to avoid
- Incompatible materials
- Hazard decomposition products

SDS: Section 11

Section 11: Toxicological information

- Provide data for all the health hazards covered by the GHS
  - If data for any of those hazards is not available, they should be listed on the SDS with a statement that data is not available
- Information on the likely routes of exposure
- Symptoms related to the physical, chemical and toxicological characteristics
- Delayed and immediate effects and chronic effects from short or long-term exposure
- Numerical measures of toxicity (such as ATE)
- Interactive effects
- Lack of specific chemical data
- Mixtures
- Mixture versus ingredient information
- Other relevant information

SDS: Sections 12 and 13

Section 12: Ecological information

- Toxicity
- Persistence and degradability
- Bioaccumulative potential
- Mobility in soil
- Other adverse effects

Section 13: Disposal considerations

- Disposal methods

SDS: Section 14

Section 14: Transport information

- UN Number
- UN Proper Shipping Name
- Transport hazard classes
- Packing group, if applicable
- Environmental hazards
- Special precautions for user
- Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SDS: Sections 15 and 16

Section 15: Regulatory information

- Regulatory information not provided elsewhere in the SDS including relevant national legislation
- Safety, health and environmental regulations specific for the chemical in question

Section 16: Other information

- Date of preparation of the latest version of the SDS
  - Clear indication of the changes made to the previous revision
- Key/legend to abbreviations and acronyms used in the SDS
- Key literature references and sources for data used to compile the SDS

Extended SDS (E-SDS)

- In the EU, **exposure scenarios** were included as a new element in the SDS – extended SDS **(E-SDS)**

- The E-SDS includes conditions of safe use:
  - ✓ Operational conditions
  - ✓ Required risk management measures

➢ **Good example of the regional implementation of the GHS as the SDS format is adapted to the regional context.**

Example: Exposure Scenarios for Xylene

Example of typical exposure scenarios, in this case for xylene:

Exposure scenario 1:

Industrial manufacturing of xylene

EXPOSURE SCENARIO

Manufacture of Substance – Industrial

Section 1	**Exposure Scenario Title**
Title	**Manufacture of Xylene isomers p-xylene, m-xylene, o-xylene;CAS RN106-42-3, 108-38-3, 95-47-6**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC1, ERC4
Processes, tasks, activities covered	Manufacture of xylene isomers or use as an intermediate or process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	*Not applicable*
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1].
	0
Contributing Scenarios	**Risk Management Measures** *Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures , 4. Personal protection. Phrases between brackets are good practice advice only, beyond REACH Chemical Safety Assessment and may be communicated in Section 5 of the ES or within the main sections of the SDS.*
General measures (skin irritants) [G19]	Avoid direct contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with the substance is likely. Clean up contamination / spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. [E3] Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release e.g. spraying [E4],
General exposures (closed systems) [CS15].	No specific measures identified [EI18].

Source: ISSPPRO

Exposure scenario 2:

Use of xylene as industrial intermediate chemical

Section 2.2	Control of environmental exposure	
Assessment method	EUSES 2.1.1 using default relase fractions from ESVOC SpERC 1.1b.v1	
Product characteristics	The Xylene isomers are liquids of medium volatility. Their average water solubility is 158mg/l; their average vapour pressure is 1050Pa at 25°C; and their average log Kow is 3.16. They are considered to be readily biodegradable.	
Amounts Used	EU tonnage	4200 ktonnes/year
	Regional tonnage	600 ktonnes/year
	Fraction of main local source	1
Frequency and duration of use	Emission days per year	300
Environmental Factors not influenced by risk management	Local Freshwater dilution factor	10
	Local marine water dilution factor	100
Conditions given in SPERC fact sheet (ESVOC SpERC 1. 1b.v1) give rise to following releases fractions		
Other Operational Conditions of use affecting environmental exposure	Release fraction to air from process	0.0001
	Release fraction to waste water from process	0.00001
	Release fraction to soil from process (regional only)	0.00001
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Treat air emissions to provide a typical removal efficiency of >90%. [TCR 7]	
	Typical onsite wastewater treatment technology provides removal efficiency of 93.57%. [TCR 11]	
	Soil emission controls are not applicable as there is no direct release to soil. [TCR 4]	
	Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Organisation measures to prevent/limit release from site	Do not apply industrial sludge to natural soils [OMS2].	

Source: ISSPPRO

Example: Exposure Scenarios for Xylene

Section 3	Exposure Estimation
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.
3.2. Environment	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted PNECs and the resulting risk characterisation ratios are expected to be less than 1.
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.
4.2. Environment	Confirm that RMMs and OCs are as described or of equivalent efficiency. The required efficiency removal from water is 93.57% which would be typically found in waste-water treatment plant.

Source: ISSPPRO

Optional Questions to Test your Knowledge

- What kind of information is provided in an SDS and why is it important?

- Look at the examples on slides 9-12. Which section includes the classification of the substance or mixture?

- Where in an SDS can you find information about measures to be applied in case of accidental release?

TIP:
Visit the UNECE GHS website if you wish to read more.

Key messages

GHS- SDS minimum information is provided in 16 sections describing :

- The identity of a substance
- Physical-chemical hazards
- Storage, handling, transport and final disposal
- Safety instructions for workers
- Emergency procedures (e.g. fire fighting, first aid)

The information are used to realize risk assessments and to establish adequate operating instructions

Additional Information

- United Nations Commission for Europe (UNECE) website on GHS: http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

- United Nations Institute for Training and Research (UNITAR) guidance documents on the GHS: http://www2.unitar.org/cwm/publications/ghs.aspx

- Swedish Chemicals Agency (KEMI) quiz to test your knowledge on GHS pictograms: http://www.kemi.se/Global/Flash/CLP-Quiz/EN/Quiz.html

Sources

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