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----------ISO 9001: 2015----------

MATERIAL SAFETY DATA SHEET

Identification
1.1GHS Product identifier
Ethyl formate, 98%
Code E 1553

2.Hazard identification
2.1Classification of the substance or mixture
Flammable liquids, Category 2
Acute toxicity - Oral, Category 4
Eye irritation, Category 2
Acute toxicity - Inhalation, Category 4
Specific target organ toxicity \u2013 single exposure, Category 3
2.2GHS label elements, including precautionary statements
Pictogram(s)

Signal word	Danger
Hazard statement(s)	H225 Highly flammable liquid and vapour H302 Harmful if swallowed H319 Causes serious eye irritation H332 Harmful if inhaled H335 May cause respiratory irritation
Precautionary statement(s)	
Prevention	P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P233 Keep container tightly closed. P240 Ground and bond container and receiving equipment. P241 Use explosion-proof [electrical/ventilating/lighting/...] equipment. P242 Use non-sparking tools. P243 Take action to prevent static discharges. P280 Wear protective gloves/protective clothing/eye protection/face protection. P264 Wash ... thoroughly after handling. P270 Do not eat, drink or smoke when using this product. P261 Avoid breathing dust/fume/gas/mist/vapours/spray. P271 Use only outdoors or in a well-ventilated area.
Response	P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. P370+P378 In case of fire: Use ... to extinguish. P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/\u2026if you feel unwell. P330 Rinse mouth. P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313 If eye irritation persists: Get medical advice/attention. P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing. P312 Call a POISON CENTER/doctor/\u2026if you

	feel unwell.
Storage	P403+P235 Store in a well-ventilated place. Keep cool. P403+P233 Store in a well-ventilated place. Keep container tightly closed. P405 Store locked up.
Disposal	P501 Dispose of contents/container to ...

2.3Other hazards which do not result in classification
none

3.Composition/information on ingredients
3.1Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Ethyl formate	Ethyl formate	109-94-4	none	100%

4.First-aid measures
4.1Description of necessary first-aid measures
General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.
If inhaled
Fresh air, rest. Refer for medical attention.
In case of skin contact
Remove contaminated clothes. Rinse skin with plenty of water or shower.
In case of eye contact
First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
If swallowed
Rinse mouth. Do NOT induce vomiting. Refer for medical attention .
4.2Most important symptoms/effects, acute and delayed
Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach; may cause deep narcosis and death if not treated. (USCG, 1999)
4.3Indication of immediate medical attention and special treatment needed, if necessary
FORMATES CAN BE METABOLIZED TO FORMIC ACID. HENCE TREATMENT AS FOR METHANOL SHOULD BE CONSIDERED.

5.Fire-fighting measures
5.1Extinguishing media
Suitable extinguishing media
Dry chemical, ... carbon dioxide.
5.2Specific hazards arising from the chemical
Behavior in Fire: Vapor is heavier than air and may travel long distance to a source of ignition and flash back. (USCG, 1999)
5.3Special protective actions for fire-fighters
Wear self-contained breathing apparatus for firefighting if necessary.

6.Accidental release measures
6.1Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.
6.2Environmental precautions
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours of low boiling point adapted to the airborne concentration of the substance. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.
6.3Methods and materials for containment and cleaning up
1. REMOVE ALL IGNITION SOURCES. 2. VENTILATE AREA OF SPILL OR LEAK. 3. FOR SMALL QUANTITIES, ABSORB ON PAPER TOWELS. EVAPORATE IN A SAFE PLACE (SUCH AS A FUME HOOD). ALLOW SUFFICIENT TIME FOR EVAPORATING VAPORS TO COMPLETELY CLEAR THE HOOD DUCTWORK. BURN THE PAPER IN A SUITABLE LOCATION AWAY FROM COMBUSTIBLE MATERIALS. LARGE QUANTITIES CAN BE COLLECTED AND ATOMIZED IN A SUITABLE COMBUSTION CHAMBER. ETHYL FORMATE SHOULD NOT BE ALLOWED TO ENTER A CONFINED SPACE, SUCH AS A SEWER, BECAUSE OF THE POSSIBILITY OF AN EXPLOSION.

7.Handling and storage
7.1Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use.Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.
7.2Conditions for safe storage, including any incompatibilities
Fireproof. Separated from strong oxidants. Cool.KEEP TIGHTLY CLOSED & PREFERABLY IN CONTACT WITH CALCIUM CHLORIDE.

8.Exposure controls/personal protection
8.1Control parameters
Occupational Exposure limit values
Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 100 ppm (300 mg/cu m).
Biological limit values
no data available
8.2Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
8.3Individual protection measures, such as personal protective equipment (PPE)
Eye/face protection
Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin protection
Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique(without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.
Respiratory protection
Wear dust mask when handling large quantities.
Thermal hazards
no data available

9.Physical and chemical properties

Physical state	COLOURLESS LIQUID
Colour	MOBILE LIQUID
Odour	Fruity odor.
Melting point/ freezing point	-80\u00b0C(lit.)
Boiling point or initial boiling point and boiling range	52-54\u00b0C(lit.)
Flammability	Class IB Flammable Liquid: Fl.P. below 22.78\u00b0C and BP at or above 37.78\u00b0C.Highly flammable.
Lower and upper explosion limit / flammability limit	Lower flammable limit: 2.8% by volume; Upper flammable limit: 16.0% by volume
Flash point	-19\u00b0C
Auto-ignition temperature	455\u00b0C
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	In water:11 g/100 mL (18 \u00baC)
Partition coefficient n-octanol/water (log value)	0.23
Vapour pressure	15.16 psi (55 \u00b0C)
Density and/or relative density	0.921g/mLat 20\u00b0C(lit.)
Relative vapour density	2.5 (vs air)
Particle characteristics	no data available

10.Stability and reactivity
10.1Reactivity
no data available
10.2Chemical stability
UNSTABLE
10.3Possibility of hazardous reactions
Burning Rate: 3.6 mm/min.The vapour is heavier than air and may travel along the ground; distant ignition possible.ETHYL FORMATE is an ester. Esters react with acids to liberate heat along with alcohols and acids. Strong oxidizing acids may cause a vigorous reaction that is sufficiently exothermic to ignite the reaction products. Heat is also generated by the interaction of esters with caustic solutions. Flammable hydrogen is generated by mixing esters with alkali metals and hydrides. This compound is incompatible with the following: Nitrates; strong oxidizers, alkalis & acids [Note: Decomposes slowly in water to form ethyl alcohol and formic acid.] (NIOSH, 2016).

10.4Conditions to avoid
no data available
10.5Incompatible materials
Nitrates; strong oxidizers, alkalis & acids [Note: Decomposes slowly in water to form ethyl alcohol & formic acid].
10.6Hazardous decomposition products
Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving ethyl formate.

11.Toxicological information
Acute toxicity
Oral: LD50 Rat oral 4.29 g/kg
Inhalation: no data available
Dermal: no data available
Skin corrosion/irritation
no data available
Serious eye damage/irritation
no data available
Respiratory or skin sensitization
no data available
Germ cell mutagenicity
no data available
Carcinogenicity
no data available
Reproductive toxicity
no data available
STOT-single exposure
no data available
STOT-repeated exposure
no data available
Aspiration hazard
no data available

12.Ecological information
12.1Toxicity
Toxicity to fish: no data available
Toxicity to daphnia and other aquatic invertebrates: no data available
Toxicity to algae: no data available
Toxicity to microorganisms: no data available
12.2Persistence and degradability
No information was found about biodegradation of ethyl formate in natural media and ethyl formate's chemical hydrolysis and volatility would complicate biodegradability testing. 33% of its theoretical BOD was realized after 10 days in a laboratory screening test using a culture originally derived from settled sewage that was >1 yr old(1). Ethyl formate is predicted to biodegrade rapidly according to a mathematical model based on group contributions(2) and the structurally similar chemical, ethyl acetate, is readily degradable on the basis of screening tests(3-7) as are other low molecular weight aliphatic esters(8).
12.3Bioaccumulative potential
Ethyl formate did not bioconcentrate in rainbow trout(1). Using a reported log octanol/water partition coefficient of 0.23(2), a BCF of 0.88 is estimated using a regression equation giving additional indication that ethyl formate should not bioconcentrate in aquatic organisms.
12.4Mobility in soil
Using a reported water solubility of 88.25 g/L(1) for ethyl formate, an estimated Koc of 8 was calculated using a regression equation(2,SRC). A Koc of 4 was estimated from molecular structure(3). According to a suggested classification scheme(3), this estimated Koc suggests that ethyl formate will be highly mobil in soil (SRC).
12.5Other adverse effects
no data available

13.Disposal considerations
13.1Disposal methods
Product
The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.
Contaminated packaging
Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14.Transport information
14.1UN Number
ADR/RID: UN1190 IMDG: UN1190 IATA: UN1190
14.2UN Proper Shipping Name
ADR/RID: ETHYL FORMATE
IMDG: ETHYL FORMATE
IATA: ETHYL FORMATE
14.3Transport hazard class(es)
ADR/RID: 3 IMDG: 3 IATA: 3
14.4Packing group, if applicable
ADR/RID: II IMDG: II IATA: II
14.5Environmental hazards
ADR/RID: no IMDG: no IATA: no
14.6Special precautions for user
no data available
14.7Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
no data available

15.Regulatory information
15.1Safety, health and environmental regulations specific for the product in question

Chemical name	**Common names and synonyms**	**CAS number**	**EC number**
Ethyl formate	Ethyl formate	109-94-4	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.

Section 16: Other Information
This safety data sheet should be used in conjunction with technical sheets. It does not replace them. The information given is based on our knowledge of this product, at the time of publication. It is given in good faith. The attention of the user is drawn to the possible risks incurred by using the product for any other purpose other than that for which it was intended. This does not in any way excuse the user from knowing and applying all the regulations governing his activity. It is the sole responsibility of the user to take all precautions required in handling the product. The aim of the mandatory regulations mentioned is to help the user to fulfill his obligations regarding the use of hazardous products.