



Product name:	Formic acid 89-97%, solution
MSDS number:	437
Material number:	80437
Published date:	07/29/2005

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Product: 89% - 97% Formic acid, solution
MSDS number: 437
Material number: 80437

Manufacturer name and address:

Celanese Ltd.
 1601 W. LBJ Freeway
 P.O. Box 819005
 Dallas, TX 75381-9005
 United States
 Phone: 972 443 4000
 Internet: www.celanesechemicals.us

Transportation emergency phone numbers: In USA, call 800 424 9300 Outside USA, call 703 527 3887, collect calls accepted

2. Composition / Information on Ingredients

Component	CAS Number	Percent %	OSHA hazard category:
CARBON MONOXIDE	630-08-0	vapor space	Hazardous
FORMIC ACID	64-18-6	89 - 97	Hazardous

Water (CAS 7732-18-5), wt. %: 3 - 11

Note: Carbon monoxide will be present in the vapor space of a closed container at a concentration of 1-2%. The concentration will be dependent on temperature and length of storage.

3. Hazards Identification

Transportation emergency:	800 424 9300	CHEMTREC, 24 hrs/day
	703 527 3887	Outside USA, collect calls accepted, 24 hrs/day
Product information:	800 835 5235	



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Emergency Overview:

DANGER!

- Causes skin, eye and digestive tract burns.
- Flammable liquid and vapor.
- Causes respiratory tract irritation.
- Harmful if inhaled.
- May be harmful if swallowed.
- May decompose to carbon monoxide and build pressure

Product Description

Appearance: Clear, colorless mobile liquid.
Odor: Strong acrid, irritating odor.

Potential health effects

Routes of exposure: Skin, eyes, inhalation, ingestion.

Immediate effects:

Skin: Causes severe skin burns. Symptoms of exposure may include: Redness or discoloration, swelling, itching, burning or blistering of skin.

Eyes: Exposure to liquid Causes severe eye burns, damage irreversible. Exposure to vapors Causes eye irritation. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

Inhalation: Causes respiratory tract irritation. Harmful if inhaled. Symptoms of exposure may include: Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty. Accumulation of fluid in the lungs (pulmonary edema); symptoms can be delayed for several hours.

Ingestion: Causes severe digestive tract burns. May be harmful if swallowed. Symptoms of exposure may include: Severe damage to the mouth, throat esophagus and/or stomach. Nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea.

Reproductive: No evidence of reproductive effects.

Carcinogenic: No evidence of carcinogenicity.

Mutagenic: Does not show mutagenic potential in Ames test. Shows mixed results for mutagenic potential in vitro.

Teratogenic: No evidence of birth defects.

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Target organ effects:	•Overexposure (prolonged or repeated exposure) may cause: Injury to the eyes Irritation of the respiratory tract Respiratory tract damage Skin damage.
Medical conditions which may be aggravated by exposure:	Significant exposure to this chemical may adversely affect people with acute or chronic disease of the: Respiratory Tract Skin Eyes
For further information, see:	Section 4 - First Aid Measures Section 5 - Fire Fighting Measures Section 6 - Accidental Release Measures Section 8 - Exposure Controls/Personal Protection Section 9 - Physical and Chemical Properties Section 10 - Stability and Reactivity

4 First Aid Measures

Skin:	Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Destroy contaminated shoes.
Eyes:	Immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. Get medical attention immediately.
Inhalation:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:	DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Note to physician:	Observe for latent pulmonary edema.

5 Fire Fighting Measures

NFPA: Health: 3 Flammability: 2 Reactivity: 0

Flammable properties

Flash point (test method): > 51 C (124 F) to < 60 C (141 F)

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Flammable limits in air, % by volume:

Upper: 38% for 99% Formic acid
Lower: 12% for 99% Formic acid

Autoignition temperature: 480 C (896 F) for 99% Formic acid

Products of combustion: Carbon Monoxide.

Extinguishing Media: Use alcohol type aqueous film forming foam for large fires. Use CO₂ or dry chemical for small fires.

Fire Fighting Instructions: Water spray should be used to cool fire-exposed structures and vessels. Water spray can be used to reduce the intensity of flames and to dilute spills to a non-flammable mixture. Keep personnel removed from and upwind of fire. If potential for exposure to vapors or products of combustion exists, wear full fire fighting turnout gear and NIOSH approved self-contained breathing apparatus. Oxidizing chemicals may accelerate the burning rate in a fire situation.

Fire Fighting Environmental Concerns: Water run-off and vapor cloud may be corrosive. Dike and collect water used to fight fire for neutralization before release. Vapors and combustion gases can be controlled using a water fog stream. Water streams should not be directed to the liquid, as this will cause the liquid to boil and generate more vapor. Thoroughly decontaminate bunker gear and other fire-fighting equipment before re-use.

6. Accidental Release Measures

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Spill or Leak Instructions Eliminate ignition sources. See Section 8 for appropriate personal protective equipment. Contain spill with dikes of soil or nonflammable absorbent to minimize contaminated area. Water fog stream may reduce vapors. If fire potential exists, blanket spill with alcohol type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. Place leaking containers in well-ventilated area. Neutralize with lime or sodium bicarbonate. Clean up small spills by using a nonflammable absorbent or flushing sparingly with water. Contain larger spills with nonflammable diking or absorbent. Clean up by vacuuming or sweeping.

Within the United States, call the National Response Center (800-424-8802) and appropriate state and local authorities if the quantity released over 24 hours is equal to or greater than the reportable quantity listed below:
5,155 lbs. of the material as is, based on a Reportable Quantity of 5,000 lbs. for acetic acid.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Isolate for 800 meters or 0.5 miles in all directions if tank, rail car, or tank truck is involved in fire. Evacuate downwind areas as conditions warrant to prevent exposure and to allow vapors or fumes to dissipate. Spills may expose downwind areas to toxic or flammable concentrations over considerable distances in some cases.

7 Handling and Storage

Handling: Use with adequate ventilation. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Avoid breathing vapor. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Decontaminate affected clothing thoroughly before re-use. Destroy contaminated leather clothing.

Formic acid decomposes to carbon monoxide, a toxic gas, and may cause pressure build-up in closed containers. Never enter an empty formic acid container until tests indicate absence of carbon monoxide. Use precautions against carbon monoxide exposure when opening containers or entering a poorly ventilated storage area.

This product may generate a static charge. Ground/bond equipment when transferring material to prevent static accumulation. Electrical equipment and circuits in all storage and handling must conform to requirements of National Electric Code (Article 500 and 501) for hazardous location.

The rate of decomposition of formic acid to carbon monoxide is affected by time and heat. Decomposition significantly increases above 30 C(86 F).

Storage: Keep all containers tightly closed when not in use. Store out of direct sunlight and on an impermeable floor.
Do not store with incompatible materials. See Section 10. Stability and Reactivity.

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8. Exposure Controls / Personal Protection

Engineering Controls: General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems.

Protective Equipment A safety shower and eyebath should be readily available.

Skin protection: Wear impervious clothing and gloves to prevent contact. Butyl rubber is recommended. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Eyeface protection: Wear chemical goggles when there is a reasonable chance of eye contact. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.

Respiratory protection: Based on workplace contaminant level and working limits of the respirator, use a respirator approved by NIOSH. The following is the minimum recommended equipment for an occupational exposure level. To estimate an occupational exposure level see Section 3, Section 8 and Section 11.

For concentrations > 1 and < 100 times the occupational exposure level: Use Type C full facepiece supplied-air respirator operated in positive-pressure or continuous-flow mode.

For concentrations > the IDLH level or unknown concentration (such as in emergencies): Use self-contained breathing apparatus with full facepiece in positive-pressure mode or Type C positive-pressure full facepiece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system.

For escape: Use self-contained breathing apparatus with full facepiece or any respirator specifically approved for escape.

Exposure guidelines

Component	CAS Number	Percent %	ACGIH TWA	ACGIH STEL	ACGIH CEILING	OSHA TWA	OSHA STEL	OSHA CEILING	Celanese WEL *	Mexico TWA	Mexico STEL	Mexico CEILING
CARBON MONOXIDE	630-08-0	vapor space	25 ppm	-	-	50 ppm	-	200 PPM	-	50 ppm	400 ppm	-
FORMIC ACID	64-18-6	89 - 97	5 ppm	10 ppm	-	5 ppm	-	-	-	5 ppm	-	-

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Component	CAS Number	Percent %	1990 NIOSH IDLH (Recognized by OSHA)	1994 NIOSH IDLH
CARBON MONOXIDE	630-08-0	vapor space	1500 PPM	1200 ppm
FORMIC ACID	64-18-6	89 - 97	30 PPM	30 ppm

9. Physical and Chemical Properties

Appearance:	Clear, colorless mobile liquid.
Odor:	Strong acrid, irritating odor.
Vapor Pressure:	23 - 31 mm Hg @ 20 C (calculated)
Boiling Point (760 mmHgA):	101 C - 105 C (calculated)
Freezing Point:	-7 C to 7 C (calculated)
Solubility in Water @ 20°C:	100%

Molecular Weight:	46.02 - Formic acid 18.0 - Water
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10. Stability and Reactivity

Stability:	Stable.
Conditions to Avoid:	Avoid heat , flames, sparks, and other sources of ignition.
Incompatibility:	Keep away from rust and other corrosion products, nickel, aluminum, sulfuric acid, bauxite, silica gel and other dehydrating agents, lime, strong alkalis, and oxidizing agents such as peroxides, nitric acid, perchloric acid or chromium trioxide.
Hazardous Combustion or Decomposition Products:	Thermal decomposition products may include oxides of carbon.
Hazardous Polymerization:	Hazardous polymerization will not occur.

11. Toxicological Information

Component Toxicological Information

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Component	CARBON MONOXIDE
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Acute Exposure: Carbon monoxide's primary toxic action is the inhibition of cellular oxidation following inhalation exposure. Approximately 80-90% of the absorbed CO binds with hemoglobin resulting in reduction in the oxygen-carrying capacity of the blood.

Inhalation: Carbon monoxide is moderately toxic to animals (LC50, 4 hr., rats: 1800 ppm); It is reported to damage nerves, cardiovascular system, liver, kidneys, lungs and spleen. It is reported to cause blood disorders.

Reproduction: Carbon monoxide is reported to cause developmental toxicity in humans and animals.

Component	FORMIC ACID
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Acute Exposure: The toxicity of formic acid in concentrated form is related to its irritant properties at the site of contact, e.g., nasal passage irritation after inhalation exposure; skin irritation after dermal exposure; gastrointestinal irritation after oral exposure (bolus administration). As is the case for many acids, toxicity (irritation) decreases as the concentration in aqueous solutions decreases. Formic acid occurs in a variety of plants, fruits and mammalian tissues. It is an important, normal body metabolite. Its safety as a food ingredient has been reviewed by the FDA.

Oral LD50: 1100-1850 mg/kg (rats); slightly toxic to animals.

Inhalation LC50: Estimated to be >500 ppm (rats, 6 hrs.) based on 60% survival of rats exposed to 500 ppm for 10 days; slightly toxic to animals. Vapors are severely irritating to the respiratory tract based on human exposure information.

Skin: Concentrated solutions of formic acid are corrosive to skin.

Eye: Concentrated solutions of formic acid are corrosive to the eyes. Vapors are severely irritating to the eyes.

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Mutagenicity: Formic acid was not mutagenic in the Ames Test with or without metabolic activation. It did not induce sister-chromatid exchanges, with or without metabolic activation, in hamster V79 cells. Positive results were reported for formic acid in the Drosophila SLRL test and in tests for chromosomal aberrations in Chinese hamster ovary cells. However, in both tests it was noted that neutralizing the acidic pH of the test environment eliminated the mutagenic responses. It was concluded that formic acid by itself is not mutagenic, but that testing at concentrations which produce nonphysiological pH levels results in "false positive" responses due to perturbations in the test systems. The weight of the evidence indicates that formic acid is not mutagenic.

Carcinogenicity: No information.

Reproductive/Developmental Effects: To screen for potential reproductive toxicity, sperm morphology/density/motility and vaginal cytology examinations were performed on rats and mice administered formic acid at 0, 8, 32 or 128 ppm via inhalation (6 hrs./day; 5 days/week) for 13 weeks. Potential impact on the length of the estrous cycle was also monitored. There were no adverse effects in rats or mice.

Repeated Exposure: Inhalation exposure (6hrs./day; 5days/week) of rats and mice was conducted at vapor concentrations of 0, 31, 62.5, 125, 250 or 500 ppm for 2 weeks. At 500 ppm, 60% survival was reported for rats. At 500 ppm and 250 ppm, the survival rates for mice were 0% and 90%, respectively. No deaths were reported at other dose levels. Microscopic examination of tissues revealed irritation of the nasal passages in rats and mice exposed to 62.5 ppm and higher concentrations. Severity increased in a dose-related manner. This was a range-finding study to set dose levels for the 13-week study discussed next.

Inhalation exposure (6hrs./day; 5days/week) of rats and mice was conducted at vapor concentrations of 0, 8, 16, 32, 64 and 128 ppm for 13 weeks. At 128 ppm, 85% survival was reported for mice. No other effects were noted on survival at other dose levels. Microscopic examination of tissues revealed irritation of the nasal passages (minimal to mild severity) primarily in animals exposed to 128 ppm. The NOAEL (no-observed-adverse-effect level) was 32 ppm.

Formic acid was administered orally to rats in drinking water for 2 to 27 weeks at doses of 8.2, 10.2, 90, 160 or 360 mg/kg/day. No mortalities were reported. Food consumption and growth were inhibited by formic acid at 360 mg/kg/day, but no adverse effects were seen at the lower doses. In another study, lower weight gain was reported in rats receiving formic acid in the diet at 0.5 and 1.0% or in drinking water at 0.5 or 1.0%.

12. Ecological Information

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Component Ecological Information

Component	FORMIC ACID
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Ecotoxicity: Formic acid exhibits low to slight acute toxicity to aquatic species.

Fish (*Leuciscus idus*) 48-hr. LC50 = 122 ppm.
 Fish (*Leuciscus idus*) 96-hr. LC50 = 46 to 100 ppm.
 Fish (*Lepomis gibbosus*) 24-hr. LC50 = 175 to 5000 ppm.

Crustacean (*Daphnia magna*) 48-hr. EC50 = 120 to 151.2 ppm.
 Crustacean (*Daphnia magna* Straus) 24-hr. EC50 = 34.2 ppm.
 Crustacean (*Daphnia magna* Straus) 48-hr. EC50 = 34.2 ppm.

Arthropod (*Artemia salina*) 24-hr. LC50 = 410 ppm.

Algae (*Scenedesmus quadricauda*) 96-hr. Toxicity Threshold = 100 ppm.
 Algae (*Scenedesmus subspicatus*) 72-hr. EC50 = 26.9 ppm.
 Algae (*Scenedesmus subspicatus*) 96-hr. EC50 = 25 ppm.

Bacteria (*Escherichia coli*) 24-hr. NOEC = 1000 ppm.
 Bacteria (*Pseudomonas putida*) 17-hr. EC50 = 46.7 ppm.
 Bacteria (Belebtschlamm species) 30-min. EC0 = 1000 ppm.

Environmental Fate:

Degradation: Formic acid was determined to be "readily biodegradable" in two separate aerobic tests according to OECD Guideline 301 E: Ready Biodegradability: Modified OECD Screening Test. In six other aerobic tests using various methods, biodegradation of formic acid ranged from 40.5 to 80.5 percent after 5 days. Seventy percent aerobic biodegradation occurred after only 1 day using the Warburg technique with activated sludge. Photodegradation (indirect photolysis) of formic acid occurs in air and water. The half-life in air is 35.7 days. The half-life in water is 0.9 year.

Bioaccumulation: The calculated values for the log octanol/water partition coefficient of formic acid range from -1.55 to -0.22. The measured log octanol/water partition coefficient is -0.54. These data indicate that formic acid has low potential to bioaccumulate.

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13. Disposal Considerations

Dispose of spilled material in accordance with state and local regulations for hazardous waste. Recommended methods are incineration or biological treatment at a federally or state-permitted disposal facility. Note that this information applies to the material as manufactured; processing, use, or contamination may make this information inappropriate, inaccurate, or incomplete.

Note that this handling and disposal information may also apply to empty containers, liners and rinsate. State or local regulations or restrictions are complex and may differ from federal regulations. This information is intended as an aid to proper handling and disposal; the final responsibility for handling and disposal is with the owner of the waste. See Section 9 - Physical and Chemical Properties.

EPA Hazardous Waste Code(s): U123

14. Transport Information

US Department of Transportation:

UN/NA Number:	UN1779
Shipping name:	FORMIC ACID SOLUTION
Hazard class:	8
Packing Group:	II
DOT Reportable Quantity (RQ):	5000 lb/ 2270 Kg
Emergency Response Guide:	153

ICAO/IATA:

IATA UN Number:	1779
Proper Shipping Name:	FORMIC ACID SOLUTION
Hazard Classification:	8
Packing group:	II
Label:	Corrosive

IMDG:

International Marine UN Number:	1779
Proper Shipping Name:	FORMIC ACID SOLUTION
Hazard Class:	8
Packing Group:	II
Flash point (test method):	> 51 C (124 F) to < 60 C (141 F)

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Transport Canada

Trade Information

Schedule B Code (export): 2915.11.0000

Harmonization Code (import): 29151100

15. Regulatory Information

U.S. STATE REGULATIONS

Chemicals associated with the product which are subject to the state right-to-know regulations are listed along with the applicable state(s):

CARBON MONOXIDE 630-08-0

Pennsylvania	Listed
New Jersey	Listed
Illinois	Listed
Massachusetts	Listed
Rhode Island	Listed

FORMIC ACID 64-18-6

Pennsylvania	Listed
New York	Listed
New Jersey	Listed
Illinois	Listed
Massachusetts	Listed
Rhode Island	Listed

CARBON MONOXIDE 630-08-0

California Proposition 65	Listed
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U.S. FEDERAL REGULATIONS

TSCA Inventory: We certify that all components are either on the TSCA inventory or qualify for an exemption.

Environmental Regulations:

CARBON MONOXIDE 630-08-0

CERCLA Hazardous Substance	Listed
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FORMIC ACID 64-18-6

EPCRA (SARA Title III)	Listed
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Section 313

CERCLA Hazardous Substance	Listed
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SARA 311:

Acute health:	Yes
Chronic health:	No
Fire:	Yes
Sudden release of pressure:	No
Reactive:	No

INTERNATIONAL REGULATIONS**International Chemical Inventory**

Listed on the chemical inventories of the following countries or qualifies for an exemption:

AUSTRALIA, CHINA, CANADA, EUROPE, KOREA, PHILIPPINES, JAPAN

16. Other Information

Prepared by: Product Stewardship Department
Celanese Ltd.

Hazard ratings This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

NFPA: Health: 3 Flammability: 2 Reactivity: 0

HMIS: Health: 3 Flammability: 2 Reactivity: 0

Revisions: The following sections have been revised since the last issue of this MSDS.

Footer: Product Information number

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For industrial use only. The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Celanese makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material may be released from gas, liquid, or solid materials made directly or indirectly from it. User has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards. Material safety data sheets are provided on the Internet by Celanese as a service to its customers. Possession of an Internet MSDS does not indicate that the possessor of the MSDS was a purchaser or user of the subject product.

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