

Material Safety Data Sheet

For Emergency Call: CHEMTREC -- (800) 424-9300

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Urea

CAS Number: 57-13-6

Chemical Name: Urea

Chemical Family: Amides

Synonyms and Common Trade Names: Carbamide
Carbonyldiamine
Carbonyl Diamide

Company Identification

Manufacturer's Name: CF Industries, Inc.

Address: One Salem Lake Drive, Long Grove, Illinois, 60047-8402

Telephone: (847) 438-9500

2. COMPOSITION/INFORMATION ON INGREDIENTS

| Component Name | Typical Weight Percentage | CAS Number |
|--|---------------------------|------------|
| Urea | 96.6-97.6 | 57-13-6 |
| Biuret ($\text{H}_2\text{NCONHCONH}_2$) | 1.0-1.5 | 108-19-0 |
| Water | 0.1-0.4 | 7732-18-5 |
| Urea reaction products with formaldehyde (primarily methylenediurea) | 1.3-1.5 | 68611-64-3 |

3. HAZARDS IDENTIFICATION

Emergency Overview

When heated, decomposes to carbon dioxide and ammonia; if burned, emits small amounts of nitrogen oxides. Can cause redness and irritation of skin and eyes.

White granules with either no odor or having a slight odor of ammonia (in presence of moisture).

Potential Health Effects

Eyes: Contact may cause eye irritation including stinging, watering and redness.

Skin: Contact may cause irritation including redness, itching and pain. No harmful effects from skin absorption.

Inhalation (Breathing): Urea dust may cause irritation of the nose, throat, and respiratory tract.

Ingestion (Swallowing): Low degree of toxicity by ingestion. May cause irritation of the digestive tract if ingested. Nausea and vomiting may occur after exposure to large volumes.

Signs and Symptoms: Effects of overexposure may include irritation of the nose, throat and digestive tract, nausea, vomiting, coughing and shortness of breath.

Cancer: Inadequate data available.

Target Organs: Inadequate data available.

Developmental: Inadequate data available.

Other Comments: None known.

Medical Conditions Aggravated by Exposure: Conditions aggravated by exposure may include skin disorders and respiratory (asthma-like) disorders.

4. FIRST AID

Eyes: Hold eyelids open and flush eyes immediately with water for at least 15 minutes. Seek medical attention if necessary.

Skin: Wash affected areas with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if symptoms occur.

Inhalation: Move to fresh air and rest. If cough or difficulty in breathing develops, administer oxygen by qualified personnel. Seek medical attention if necessary.

Ingestion: Rinse mouth and drink plenty of water. Induce vomiting if exposed to high volumes of a low concentration. Seek medical attention if necessary.

Notes to Physician: None

5. FIRE FIGHTING MEASURES

Urea is not flammable.

Flash Point (test method): Not applicable

Flammable Limits: Not applicable

Explosive Limits: Not applicable

Autoignition Temperature: Not applicable

Extinguishing Media: Use water, carbon dioxide, foam, or dry chemical.

| | | |
|--------------------------|-----------------|----------------|
| NFPA Fire Rating: | Flammability | 0 |
| | Health Hazard | 1 |
| | Reactivity | 0 |
| | Specific Hazard | Not applicable |

Key: Least = 0, Slight = 1, Moderate = 2, High = 3, Extreme = 4

Special Firefighting Procedures: Fire fighters should use NIOSH approved self-contained breathing apparatus and full protective equipment when fighting chemical fires.

Unusual Fire and Explosive Hazards: Urea forms hazardous decomposition products, including ammonia. Refer to Section 10 for details.

6. ACCIDENTAL RELEASE MEASURES

Recover any reusable product, taking care not to generate excess dust. Use caution as product may be slippery when wet. Keep product out of sewage and drainage systems and all bodies of water as it may be toxic to aquatic organisms. Clean up spills immediately.

Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

Neutralizing Chemicals: Not applicable

7. HANDLING AND STORAGE

Handling: The use of respiratory protection is advised when dust concentrations exceed any established exposure limits (see Section 8).

Storage: Keep dry. Urea will absorb moisture from air. If storage piles become wet, surrounding floor may be slippery. Reacts with hypochlorites to form nitrogen trichloride, which explodes spontaneously in air. Reacts with nitric acid to form urea nitrate that decomposes explosively when heated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Use process enclosure, general dilution ventilation, or local exhaust systems, where necessary, to maintain airborne dust concentrations below the OSHA standard.

Personal Protective Equipment

Eyes: No personal protective equipment normally required. If dusting of dry product or splashing of solutions is possible, use chemical safety goggles and/or full-face shield.

Skin: No personal protective equipment normally required. If dusting of dry product or splashing of solutions is possible, wear protective gloves and clothing.

Respiratory: Protection is not normally required. Wear a dust mask or other appropriate respiratory protection during operations that generate airborne dust concentrations exceeding the relevant standards or when effective engineering controls are not feasible. A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

Exposure Guidelines*

Although standards for urea have not been established, the following nuisance dust standards are applicable.

ACGIH TLV: 10 mg/m³ – inhalable particulate; 3 mg/m³ – respirable particulate

OSHA PEL: 15 mg/m³ TWA (total) (7); 5 mg/m³ TWA (respirable)

* TLV = Threshold Limit Values; PEL = Permissible Exposure Limits;
TWA = 8-hour Time-weighted Average

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White granules

Odor: Odorless or slight ammonia odor

Odor threshold level: Not available

Physical state: Solid

pH: 7.2 (10% water solution)

Vapor pressure: Not applicable

Vapor density (air = 1): Not applicable

Boiling point: Not applicable

Melting point: Decomposes at 270.8°F (132.7°C)

Solubility in water: 119 g per 100 g water at 77°F (25°C)

Specific gravity ($H_2O = 1$): 1.34 at 68°F (20°C); (heavier than water)

Evaporation rate (butyl acetate = 1): Not applicable

Viscosity: 1.78 mPas (46% solution) at 68°F (20°C); 1.81 mPas (46% solution) at 278.60°F (137°C); 1.90 mPas (saturated solution) at 68°F (20°C)

Percentage volatile by volume (%): Not applicable

Molecular weight: 60.06

Molecular formula: NH_2CONH_2

10. STABILITY AND REACTIVITY

Stability (thermal, light, etc.): Stable under normal conditions of storage and handling.

Incompatibility (materials to avoid): Nitric acid, sodium nitrite, nitrosyl perchlorate, gallium perchlorate, hypochlorites, phosphorus pentachloride.

Hazardous Decomposition Products: When heated above melting point, decomposes to ammonia and carbon dioxide. If burned, emits small amounts of nitrogen oxides.

Hazardous Polymerization: Will not occur

Conditions to Avoid: Decomposes when heated above melting point.

11. TOXICOLOGICAL INFORMATION

Urea

Rat LD50 = 15 g/kg

Mouse LD50 = 11.5 g/kg

Urea dust at 22 mg/m³ caused mild irritation (species not specified)

In a repeated dose toxicity study, urea at 10%, 20%, and 40% in ointment was applied to the back skin of rats for 4 weeks. No dose-dependent toxicity was observed. There were no consistent treatment-related effects on standard haematological parameters, clinical chemistry, organ weights or organ histopathology, including the testicles, prostate, seminal vesicles, ovaries and the uterus.

In a chronic toxicity and carcinogenicity screening study conducted in mice over 12 months, urea was administered at 0.45%, 0.9%, and 4.5% in the diet. No pathology was reported immediately following treatment period. After 4 months, testes, prostate, and uterus were histologically examined for occurrence of tumors in the survivors. Although there was a statistically increased incidence of interstitial cell adenomas of the testes in the high dose group, its biological significance was deemed questionable, since the lesion may occur in 100% of controls.

In a single oral dose study in mice, 2,000 mg/kg administered on day 10 of pregnancy was not teratogenic. Urea in water was given in 2 doses 12 hours apart by gavage to rats during pregnancy for 14 days and the dams were allowed to deliver. No hypertrophy or other kidney changes were

detected nor were any teratogenic effects noted. Urea caused developmental effects in chick embryos when injected into eggs.

Urea was negative in tests of bacterial mutagenicity and demonstrated low clastogenic potential in non-bacterial mutagenicity tests. Chromosome breakage has been observed in some laboratory tests using extremely high concentrations of urea. At near lethal doses, urea was mutagenic in in-vivo non-bacterial tests in mice.

Urea is not recognized as a carcinogen by IARC, NTP, or OSHA.

Biuret

Oral rat LD50 > 5 g/kg
Dermal rat LD50 > 2 g/kg

Biuret is not recognized as a carcinogen by IARC, NTP, or OSHA.

12. ECOLOGICAL INFORMATION

Urea can be toxic to domestic animals and has caused poisonings when it was applied unevenly on pastures as a fertilizer. Large amounts of urea can damage plant seedlings and inhibit germination. At high concentrations, urea can be toxic to aquatic life. As a readily available source of nitrogen, urea can also foster excessive growth of algae or microorganisms in water systems. Notify local health and wildlife officials and operators of nearby water intakes upon contamination.

Ecotoxicity Information: The cell multiplication toxicity threshold values for bacteria, green algae, and protozoa are >10,000, >10,000, and 29 mg/L, respectively. The critical range for the creek chub is 16,000 to 30,000 mg/L in Detroit river water.

Environmental Fate Information: Particulate-phase urea is physically washed out of the atmosphere by dry and wet deposition. In the soil, urea degrades rapidly, usually within 24 hours; however, degradation may be slower depending on soil type, moisture content, and urea formulation. The ultimate degradation products are carbon dioxide and ammonia. The soil mobility is high based on an organic carbon partition coefficient of 8. In water, biodegradation to carbon dioxide and ammonia is the major fate pathway. The biodegradation rate increases with increasing temperature and presence of phytoplankton. Oxidation of urea by nitrifying bacteria can increase biological oxygen demand. Bioaccumulation of urea is very low. The 72-hour bioconcentration factor (BCF) for carp is reported to be 1.

13. DISPOSAL CONSIDERATIONS

Urea is not considered a hazardous waste under Federal Hazardous Waste Regulations 40 CFR 261. Consult local or state environmental regulatory agencies for acceptable disposal procedures and locations. Follow standard disposal procedures.

14. TRANSPORT INFORMATION

Urea is not listed as a hazardous material by the U.S. Department of Transportation (DOT), Transport Canada (TC), International Maritime Organization (IMO), and the United Nations (UN).

15. REGULATORY INFORMATION

OSHA (Occupational Safety and Health Administration): This material is considered to be hazardous as defined by the OSHA Hazard Communication Standard.

SARA TITLE III (Superfund Amendment and Reauthorization Act of 1986): No federal requirements. User should contact local and state regulatory agencies for information on additional or more stringent reporting requirements.

Sections 311/312: This product has been reviewed according to the U.S. EPA "Hazard Categories" promulgated under Sections 311 and 312 of SARA Title III and is considered, under applicable definitions, to meet the following categories:

Immediate Health

DOT (Department of Transportation): Please refer to Section 14 (Transport Information) for guidance concerning transportation.

PROPOSITION 65: Not listed

This material has not been identified as a carcinogen by NTP, IARC, or OSHA.

16. Documentary Information and DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Issue Date: 4/17/00

Previous Issue Date: 06/01/96

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