CFIndustries®

Effective Date: July 6, 2009

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

Product Uses

Agricultural Industry: Fertilizer, manufacturing of specialty fertilizers

Industrial Applications: Production of specialty pollution control solutions

Chemical Name: Urea

Chemical Family: Amides

Synonyms and Common Trade Names: Carbamide
carbonyldiamine
carbonyl diamide

Company Identification

Manufacturer: CF Industries, Inc.

Address: 4 Parkway North, Suite 400
Deerfield, Illinois 60015-2590

Telephone: 847-405-2400

Effective Date: July 6, 2009

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	Weight Percentage	CAS Number
Urea	95.4-97.6	57-13-6
Biuret (H2NCONHCONH2)	1.0-1.5	108-19-0
Water	0.1-0.4	7732-18-5
Urea reaction products with formaldehyde (primarily methylenediurea)	1.3-2.7	68611-64-3

3. HAZARDS IDENTIFICATION

Emergency Overview

Notice! 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 the presence of moisture).

Potential Health Effects

Eyes: Eye irritant. May cause irritation, redness and pain.

Skin: Skin irritant. May cause irritation, redness, itching and pain. Not expected to be toxic by dermal exposure.

Inhalation: Not expected to be toxic by inhalation. Urea dust may cause coughing and irritation of the nose, throat and respiratory tract.

Ingestion: Not found to be toxic by oral exposure. May cause irritation of the digestive tract if ingested. Nausea, vomiting, diarrhea and transient disorientation may occur in the event a large quantity has been ingested.

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

Late Toxicities: Urea is not known to cause mutagenic, carcinogenic or reproductive effects from concentrations or exposure routes normally experienced in the workplace.

4. FIRST AID

Eyes: Move victim away from exposure and into fresh air. If irritation or redness develops, flush eyes with clean water. For direct contact, hold eyelids open and flush eye(s) immediately with clean water for at least 15 minutes. Seek medical attention if necessary.

Skin: Flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. Wash contaminated clothing before reuse. If irritation or redness develops, seek medical attention.

Inhalation: Remove victim from source and allow to rest in well ventilated area. If breathing is difficult, obtain immediate medical attention.

Ingestion: Rinse mouth and drink plenty of water. Seek medical attention if necessary.

Notes to Physician: None.

5. FIRE FIGHTING MEASURES

Flammability:	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 extinguishing media suitable for surrounding fire.

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: At elevated temperatures, urea forms hazardous decomposition products, including ammonia. Refer to Section 10 for details. Explosive on contact with halogens such as chlorine.

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. 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

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

Preventative Measures / Specific Personal Protective Equipment

Eyes: Personal protective equipment is not normally required.

Skin: Personal protective equipment is not normally required.

Respiratory: Protection is not normally required unless relevant exposure standards are exceeded. Use appropriate respirators when adequate engineering and work practice controls are not technically feasible or when performing certain maintenance, repair or emergency operations where excessive exposure could occur.

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
STEL = 15-minute Short Term Exposure Limit

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 (760 mm Hg):	Not applicable
Melting point:	Decomposes at 270.8°F (132.7°C)
Solubility in water (per 100 g water):	119 g at 77°F (25°C)
Specific gravity (H20 = 1):	Not applicable
Bulk Density:	44 to 49 lbs/ft^3
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
Octanol Water Partition Coefficient (K_{OW}):	0.026

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

Oral LD50: Ranges from 11.5 g/kg (female mouse) to 15 g/kg (female rat)

Dermal LD50: No data available.

Inhalation LC50: No data available.
Urea dust at 22 mg/m3 caused mild irritation (species not specified).

Sensitization Capability: No data available.

Synergistic Chemicals: No data available.

Subchronic Toxicity: 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 hematological parameters, clinical chemistry, organ weights or organ histopathology, including the testicles, prostate, seminal vesicles, ovaries and the uterus.

Chronic Toxicity: In a chronic toxicity and carcinogenicity screening study conducted in mice over 12 months, urea was administered at 0, 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 testis in the high dose group, its biological significance was deemed questionable, since the lesion may occur in 100% of controls.

Teratogenicity: 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.

Mutagenicity: 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 LD50: No data available.

Dermal LD50: No data available.

Inhalation LC50: No data available.

Sensitization Capability: No data available.

Synergistic Chemicals: No data available.

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

Methylenediurea

No toxicity data was located in the toxicology or medical literature for methylenediurea. Based on the toxicology testing of urea, which contains methylenediurea, methylenediurea is expected to have a low order of acute and chronic toxicity. Direct contact with eyes and skin may cause irritation, redness, itching and pain.

Oral LD50: No data available.

Dermal LD50: No data available.

Inhalation LC50: No data available.

Mutagenicity: No data available.

Teratogenicity: No data available.

Sensitization Capability: No data available.

Synergistic Chemicals: No data available.

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

12. ECOLOGICAL INFORMATION

Large amounts of urea can damage plant seedlings and inhibit germination. As a readily available source of nitrogen, urea can also foster excessive growth of algae or microorganisms in water systems.

Urea is non-toxic to aquatic organisms as defined by USEPA.

Fish 96 hour LC50: >9,100 mg/L

Daphnia 24 hour EC50: >10,000 mg/L

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, state and/or provincial environmental regulatory authorities 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.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act): This product does not contain Reportable Quantity substances.

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 USEPA "Hazard Categories" promulgated under Sections 311 and 312 of SARA Title III and is considered, under applicable definitions, to meet the following categories:

Acute: yes Chronic: no Fire: no Reactivity: no

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

Proposition 65 (CA Health & Safety Code Section 25249.5): Not listed

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

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16. DOCUMENTARY INFORMATION AND DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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