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READ THE ENTIRE LABEL BEFORE USING THIS PRODUCT.

USE ONLY IN ACCORDANCE WITH INSTRUCTIONS.

KEEP OUT OF REACH OF CHILDREN

UREA 46% (CARBAMIDE)

COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name : Carbamide – commonly referred to as Urea
Chemical Family : Amides
CAS Number : 57-13-6
EINECS Number : 200-315-5
Molecular formula: CH₄N₂O
Product Uses : Agricultural industry :
Fertilizer, manufacturing of specialty fertilizers
Industrial application :
Production of specialty pollution control solutions

Synonyms and Common Trade Names :
Carbamide, carbonyldiamine, carbonyl diamide

Component Name	Weight Percentage	CAS Number
Urea	95.4 - 97.6	57-13-6
Biuret (H ₂ 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 - 2.7	68611-64-3

Product containing urea as essential ingredient (Total nitrogen 46%).

What is Urea 46% (Carbamide) and how does it work?

Urea is a naturally occurring compound contained in urine from mammals. It is manufactured by combining carbon dioxide with ammonia and is the most commonly used

nitrogen fertilizer worldwide. With more than 46% nitrogen, it has the highest nutrient concentration among the commercially available solid nitrogen fertilizers. It can be applied in a solid prilled or granulated form. Although soluble in water, its application in fluid form is uncommon.

In the soil, urea is converted from carbamide nitrogen to ammonium ions (NH₄⁺) by a series of enzyme reactions. Under normal soil conditions, the ammonium ions are absorbed by the soil (i.e. become attached to the negatively charged soil particles) and the nitrogen becomes available to the plant, either in its ammonium form or as nitrate following microbial oxidation. Urea derived ammonium behaves in exactly the same way as that from other ammonium based nitrogen fertilizers. This breakdown of urea to release ammonium ions normally occurs within a week.

The most favourable conditions for the efficient absorption of ammonium ions are:

- when urea fertilizer is incorporated or well washed into the soil
- when the soil has a high absorption capacity
- when the soil is sufficiently moist
- when the soil has a low pH
- at low temperatures

Unfavourable conditions, such as:

- persistent drought
- high temperatures and strong winds
- soil which has a low capacity for absorbing ammonium
- soil which has a high pH

may promote measurable gaseous losses of ammonia (NH₃) which has been converted from ammonium and released to the atmosphere (after the application of fertilizer).

Key Benefits of UREA 46%

(CARBAMIDE):

In the past decade urea has surpassed and nearly replaced ammonium nitrate as a fertilizer.

- Urea can be applied to soil as a solid or solution or to certain crops as a foliar spray.
- Urea usage involves little or no fire or explosion hazard.
- Urea's high analysis, 46% N, helps reduce handling, storage and transportation costs over other dry N forms.
- Urea manufacture releases few pollutants to the environment.
- Urea, when properly applied, results in crop yield increases equal to other forms of nitrogen.

Urea has a number of advantages over other nitrogen fertilizers. Urea is safer to ship and handle, it is less corrosive to equipment, it has a higher analysis than any other dry nitrogen fertilizer and it can be used on virtually all crops. Urea can be stored and distributed through conventional systems. It can be applied in many different ways from sophisticated aerial application equipment to a farm spreading urea by hand. Urea is also highly water soluble so it moves readily into the soil. The high analysis means a reduced transportation and application cost per pound of nitrogen.

Urea is 46% nitrogen. This is the highest concentration dry nitrogen fertilizer available.

Urea itself is very mobile because it is a neutral molecule, it has no charge and is not attracted to soil particles. This means it can rapidly move into the soil following irrigation or rain. Once in the soil, however, it is rapidly converted into ammoniacal nitrogen, which is attracted to the soil particles, thus preventing leaching loss.

TRANSPORT INFORMATION

Urea is not classified, i.e. considered non-hazardous material according to UN Orange Book and International transport codes e.g. RID (rail), ADR (road) and IMDG (sea).

PRECAUTIONS

Harmful if swallowed, inhaled or absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse. Keep children or pets away from treated area until dry.

SYMPTOMS OF POISONING

Irritation on skin or eyes

MEDICAL TREATMENT

No specific antidote is available. Treatment is symptomatic.

FIRST AID MEASURES

Eye Contact : Flush / irrigate eyes with large amount of water for at least 10 minutes until irritation subsides. If eye irritation persists, seek medical attention.

Skin Contact : Wash the affected areas with soap and water.

Ingestion : Do not induce vomiting. Give water or milk to drink. Obtain medical attention if more than small quantities have been swallowed.

Inhalation : Remove from source of exposure to dust. Keep warm and at rest. Obtain medical advice if symptoms persist.

STABILITY AND REACTIVITY

Stability

The product is stable under normal conditions of storage, handling and use.

Conditions to avoid

- Heating above melting point.
- Welding or hot work on equipment or plant which may have contained fertilizer without first washing thoroughly to remove all fertilizer.

Materials to avoid

Strong oxidizers, acids, alkalis, nitrates, sodium or calcium hypochlorite.

Hazardous reactions / decomposition products

Urea reacts with sodium or calcium hypochlorite to form explosive nitrogen trichloride.

PERSONAL PROTECTION

For open systems where contact is likely, wear safety glasses with side shields, long sleeves and chemical resistant gloves. Where over-exposure by inhalation may occur, and engineering, work practice or other means of exposure reduction are not adequate, approved respirators may be necessary. Wear suitable gloves when handling the product over long periods. Use suitable dust respirator if dust concentration is high.

DIRECTIONS OF USE (GUIDELINES)

The following criteria are based upon scientific evidence and agronomic experience of urea fertilizer use. These measures contribute to ensuring efficient use of nitrogen in urea whilst minimising ammonia emissions:

- Urea should be incorporated into the soil during a tillage operation, if possible.
- On bare, light (sandy) soils, urea should only be used for the first nitrogen application, and only on condition that it is incorporated as soon as possible.
- On medium and heavy soils, urea can be used for both the first nitrogen application to the soil and for top dressing.
- Urea is well suited for top dressing of winter cereals during early springtime on all soils.
- Urea should preferably be spread when rain is forecast, or should be washed into the soil by irrigation.
- Urea use on grassland is appropriate during the early growing season, during

- periods of rainfall or if there is irrigation after application.
- On alkaline soils (pH > 7.5), urea should be incorporated into the soil immediately after spreading.
 - At high temperatures and when the soil is dry, urea should only be applied if it can be incorporated without delay. It should not be applied during the hottest part of the day.
 - Do not use urea soon after liming.
 - Do not spread urea on top of slurry, manure toppings, crop residues or anything that will impede the quick absorption of ammonium ions by the soil.
 - Urea can be applied to both dry land and irrigated land as a top dressing and as a base dressing. Depending on the local conditions, rates of 250 kg/ha urea or more should be spread in two applications.

USES

Agricultural use

Urea is used as a nitrogen release fertilizer as it hydrolyses back to ammonia and carbon dioxide, but its most common impurity (biuret, $\text{NH}_2\text{-CO-NH-CO-NH}_2$) must be present at less than 2% as it impairs plant growth. It is also used in many multi-component solid fertilizer formulations. Its action of nitrogen release is due to the conditions favouring the reagent side of the equilibria which produce urea.

Urea is usually spread at rates of between 40 and 300 kg/ha, but actual spreading rates will vary according to farm type and region. It is better to make several small to medium applications at intervals to minimise leaching losses and increase efficient use of the N applied compared with single heavy applications. During summer, urea should be spread just before, or during rain to reduce possible losses from volatilisation (process where nitrogen is lost to the atmosphere as ammonia gas). Urea should not be mixed for any length of time with other fertilizers as problems of physical quality may result.

Because of the high N concentration in urea, it is very important to achieve an even spread. Make sure that the application equipment has been correctly calibrated and is properly used. Do not drill on contact with or close to seed, due to the risk of germination damage. Urea dissolves in water for application as a spray or through irrigation systems.

In grain and cotton crops, urea is often applied at the time of the last cultivation before planting. It should be applied into, or be incorporated into the soil. In high rainfall areas and on sandy soils (where nitrogen can be lost through leaching) and where good in-season rainfall is expected, urea can be side or top-dressed during the growing season. Top-dressing is also popular on pasture and forage crops. In sugarcane, urea is side-dressed after planting, and applied to each ratoon crop.

In irrigated crops, urea can be applied dry to the soil, or dissolved and applied through the irrigation water. Urea will dissolve in its own weight in water, but it becomes increasingly difficult to dissolve as the concentration increases. Dissolving urea in water is endothermic, causing the temperature of the solution to fall when urea dissolves.

As a practical guide, when preparing urea solutions for fertigation (injection into irrigation lines), dissolve no more than 30 kg urea per 100 L water.

In foliar sprays, urea concentrations of 0.5 – 2.0% are often used in horticultural crops. As urea sprays may damage crop foliage, specific advice should be sought before use. Low biuret grades of urea should be used if urea sprays are to be applied regularly or to sensitive horticultural crops.

Industrial use

Urea has the ability to form 'loose compounds' with many organic compounds. The organic compounds are held in channels formed by interpenetrating helices comprising of hydrogen bonded urea molecules. This behaviour can be used to separate mixtures and has been used in the production of aviation fuel and lubricating oils. As the helices are interconnected all helices in a crystal must have the same 'handedness'. This is determined when the crystal is nucleated and can thus be forced by seeding. This property has been used to separate racemic mixtures.

Further commercial uses include:

- Urea is also employed as a stabilizer in nitrocellulose explosives
- As a reactant in the NO_x -reducing SNCR and SCR reactions in exhaust gases from combustion, for example from power plants and diesel engines.
- As a component of fertilizer and animal feed, providing a relatively cheap source of fixed nitrogen to promote growth.
- As a raw material for the manufacture of plastics specifically, urea-formaldehyde resin.

- As a raw material for the manufacture of various glues (urea-formaldehyde or urea-melamine-formaldehyde). The latter is waterproof and is used for marine plywood.
- As an alternative to rock salt in the deicing of roadways and runways. It does not promote metal corrosion to the extent that salt does.
- As an additive ingredient in cigarettes, designed to enhance flavour.
- Sometimes used as a browning agent in factory-produced pretzels.
- As an ingredient in some hair conditioners, facial cleansers, bath oils and lotions.
- It is also used as a reactant in some ready-to-use cold compresses for first-aid use, due to the endothermic reaction it creates when mixed with water.
- Used, along with salts, as a cloud seeding agent to expedite the condensation of water in clouds, producing precipitation.
- The ability of urea to form clathrates (also called host-guest complexes, inclusion compounds, and adducts) was used in the past to separate paraffins.
- As a flame-proofing agent (commonly used in dry chemical fire extinguishers as Urea-potassium bicarbonate)
- As an ingredient in many tooth whitening products.
- Added to stainless steel alloys used in some Japanese knives to retain sharpness.
- As a cream to soften the skin, especially cracked skin on the bottom of one's feet.
- As an ingredient in dish soap.

Laboratory use

Urea is a powerful protein denaturant. This property can be exploited to increase the solubility of some proteins. For this application it is used in concentrations up to 10 M. Urea is used to effectively disrupt the noncovalent bonds in proteins. Urea is an ingredient in the synthesis of urea nitrate. Urea nitrate is also a high explosive very similar to ammonium nitrate, however it may even be more powerful because of its complexity. VOD is 11,000 fps to 15,420 fps.

Medical use

Drug use

Urea is used in topical dermatological products to promote rehydration of the skin. If covered by an occlusive dressing, 40% urea preparations may also be used for nonsurgical debridement of nails. This drug is also used as an earwax removal aid.

Clinical diagnosis

See blood urea nitrogen ("BUN") for a commonly performed urea test, and marker of renal function.

Other diagnostic use

Isotopically-labeled urea (carbon 14 - radioactive, or carbon 13 - stable isotope) is used in the Urea breath test, which is used to detect the presence of *Helicobacter pylori* (*H. pylori*, a bacterium) in the stomach and duodenum of humans. The test detects the characteristic enzyme urease, produced by *H. pylori*, by a reaction that produces ammonia from urea. This increases the pH (reduces acidity) of the stomach environment around the bacteria.

Similar bacteria species to *H. pylori* can be identified by the same test in animals (apes, dogs, cats including big cats).

Textile use

Urea in textile laboratories are frequently used both in dyeing and printing as an important auxiliary which provides solubility to the bath and retains some moisture which is required for the dyeing or printing process.

DISPOSAL METHODS / CONSIDERATIONS

Relevant authorities must be consulted before disposal of urea to drains or water courses. Sweep up spilled material and place in suitable containers for recycle or disposal. If spilled urea enters a water course then the appropriate water authority and local authorities should be informed.

Any spillage of fertilizer should be cleaned up promptly, swept up and placed in a clean, labelled, open container for safe disposal.

Depending on the degree and nature of contamination, dispose of by use as a fertilizer on farm by spreading thinly on open ground or to an authorised waste facility.

HANDLING

Avoid excessive generation of dust.

Avoid unnecessary exposure to the atmosphere to prevent moisture pick-up.

When handling the product over long periods use appropriate personal protective equipment e.g. gloves.

STORAGE

Storage should be in absence of source of heat or fire and moisture to prevent lumps and dust forming. Storage may be in bulk or polyethylene bags. Ensure high standard of housekeeping in the storage area. Any building used for the storage should be dry and well ventilated.

For More Details including effects on environment email contact@ivorychem.com with Subject "UREA 46% CARBAMIDE DETAILS".

More Details:

TOXICOLOGICAL EFFECTS

Urea is not classified as a hazardous product.

Normally, by paying usual attention to industrial hygiene and by avoiding inhalation of dusty powder, there are no risks in handling urea.

The dust may cause irritation to eyes, skin and by inhalation.

By decomposition at high temperature toxic fumes of nitrogen oxide, ammonia and isocyanic acid can be emitted. These can also be produced by reaction of Urea with the chemicals. Product should not be heated above 130°C to avoid possible release of toxic fumes of ammonia, isocyanic acid and oxides of nitrogen. Contact should be avoided with oxidising agents, hypochlorites, aldehydes, inorganic acids, olefins, monomers and polymerisable esters to avoid possible release of toxic fumes of ammonia, isocyanic acid, oxides of nitrogen and biuret.

Product can accumulate static charges which can cause an incendiary electrical discharge : proper grounding procedures should be used.

Eye Contact : Irritating but does not injure eye tissue.

Skin Contact : Frequent or prolonged contact may irritate. Low order of toxicity.

Inhalation : Negligible hazard at ambient temperature. Decomposition fumes may cause breathing disorders and/or lung damage. High dust concentrations of air-borne material may cause irritation of the nose and upper respiratory tract.

Ingestion : Small quantities are unlikely to cause toxic effect. Large quantities may give rise to gastro-intestinal disorders.

When heated, urea decomposes releasing ammonia. In a fire, toxic fumes containing ammonia and NOx may be released.

Toxicity Data

LD50 (oral, rat) > 2000 mg/kg

ECOLOGICAL EFFECTS

Urea is highly soluble in water. Therefore it is rapidly diluted in water courses and leached from soils. When dissolved, urea will act as a plant nutrient. It has low intrinsic aquatic toxicity but will exert a substantial oxygen demand when significant quantities as in a spillage reach a watercourse and may cause damage to aquatic life.

ENVIRONMENTAL FATE

Take care to avoid the contamination of watercourses and drains and inform the appropriate authority in case of accidental contamination of watercourses.

Avoid high dust concentration and provide ventilation where necessary.

PHYSICAL AND CHEMICAL PROPERTIES AND GUIDELINES

Physical and chemical properties

Appearance : White granules or prills or crystals

Odour : Odourless

Nitrogen : 46% minimum

pH of 10% water solution : 9.0 – 10.0

Melting point : Decomposes at 133°C

Bulk Density : 700 – 780 kg/m³

Solubility in water : 1080g/l at 20°C

Flammability (solids) : Not flammable (Method A10 EEC)

Explosive properties : Uncontaminated urea is not an explosion hazard. However it may form explosive mixtures subject to spontaneous detonation when contaminated with strong acid (nitric or perchloric) or nitrates.

Oxidizing properties : None.

UREA 46% (CARBAMIDE)	Prilled	Granulated
Nitrogen	46% min	
Biuret	1% max	
Bunter		1% max by weight
Moisture	0.5% max by Fisher	1% max by weight
	0.3% max dryer	
Anti-caking	0.5% max	treated against

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Incorporated in the Republic of Singapore Under the Companies Act (Cap 50)

agent		anti caking
Prilled	95%	
Free ammonia	160 pxt ppm max	
Granulation	1 - 4 mm, 90% min	2 - 4 mm 90%
		lesser than 2 mm 1%
		greater than 3 mm 4%
Color	standard white or pure white	
Free flowing	100% anticaking treated	
Physical	free from harmful substance, impurities, dust	
Radiation	certified fully non-radioactive 100% free flowing	



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Exposure guidelines

The recommended time weighted average exposure limits are as follows: -

Long term Exposure Limit (OEL)
(TWA-8 hr)

	mg/m ³	ppm
Ammonia	18	25
Nitrogen Dioxide *	5	3
Nitrogen Dioxide	30	25
Isocyanic acid	0.02	

Short term Exposure Limit (STEL)
(TWA-10 min)

	mg/m ³	ppm
Ammonia	24	35
Nitrogen Dioxide *	9	5
Nitrogen Dioxide	45	35
Isocyanic acid	0.07	

* Most toxic component of NOx

ACGIH recommended value (1995-96) for
inhalable particulate :
TLV/TWA : 10mg/m³

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