Product Safety Assessment

**DOW™ Aminopolycarboxylic Chelate Products**


Select a Topic:

- Names
- Product Overview
- Manufacture of Product
- Product Description
- Product Uses
- Exposure Potential
- Health Information
- Environmental Information
- Physical Hazard Information
- Regulatory Information
- Additional Information
- References

**Names**

- CAS Nos. 64-02-8, 20824-56-0, 22473-78-5, 5964-35-2, 6381-92-6, 139-33-9, 23411-34-9, 62-33-9, 60-00-4, 135-37-5, 139-41-3, 5964-35-2
- Tetrasodium salt of ethylenediaminetetraacetic acid (EDTA)
- Tetrasodium ethylenediaminetetraacetate
- Tetrasodium salt of EDTA
- Na₄(EDTA)
- Glycine, N,N’-1,2-ethanediylbis[N-(carboxymethyl)tetrahydrate]
- Na₄(EDTA)•4H₂O
- Ethylenediaminetetraacetic acid
- H₄(EDTA)
- Calcium disodium ethylenediaminetetraacetate dihydrate
- CaNa₂(EDTA)•2H₂O
- Diammonium ethylenediaminetetraacetate
- Diammonium salt of EDTA
- (NH₄)₂(EDTA)
- Disodium ethylenediaminetetraacetate dihydrate
- Na₂H₂(EDTA)•2H₂O
- Disodium EDTA FCC
- Tetrapotassium ethylenediaminetetraacetate
- Tetraammonium ethylenediaminetetraacetate
- (NH₄)₄(EDTA)
- Pentasodium diethylenetriaminepentaacetate
- Na₅(DTPA)
- DTPA
- Diethylenetriaminepentaacetic acid
- H₅(DTPA)
- Trisodium salt of N-(hydroxyethyl)-ethylenediaminetriacetic acid
- Trisodium N-(hydroxyethyl)-ethylenediaminetriacetate
- Na₃HEDTA
- Sodium diethanoglycine
- Na(DEG)
- Disodium ethanodiglycine
- Na₂(EDG)
- Na₂(HEIDA)
- HEDTA
- HEEDTA
- EDTA acid

Dow sells a wide variety of aminopolycarboxylic products under the trade names VERSENE™, VERSENOL™, and VERSENEX™ chelating agents, as outlined in detail in the [Product Description](#) section.

[Back to top](#)
Product Overview

- Dow manufactures several families of chelating products based on aminopolycarboxylic acid under the trade names VERSENE™, VERSENOL™, and VERSENEX™ chelating agents. A chelating agent (sequestering agent) is a material that captures free metal ions in water-based solutions, including gels and creams. DOW™ aminopolycarboxylate chelate products are formulated as liquids and solids.¹²³ For further details, see Product Description.

- DOW aminopolycarboxylate chelate products inhibit undesirable metal-catalyzed reactions by forming complexes with free metal ions. They are also used to stabilize or buffer pH. Uncontrolled metal ions can cause scaling, degradation, discoloration, rancidity, and spoilage. For example, a trace amount of copper or iron can ruin salad dressings or mayonnaise. DOW aminopolycarboxylate chelate products are added to process water or directly to products during formulation and are used in agriculture, cleaning products, food and beverages, metalworking, oil-field applications, personal-care products, pharmaceuticals, water treatment, and many other industries.¹⁴ For further details, see Product Uses.

- Because trace metal ions can be found everywhere in the environment, chelating agents are needed almost everywhere in industry. Worker exposure to chelating agents is possible in facilities that manufacture or use them. Since chelating agents are common in foods, juices, soft drinks, shampoos, lotions, vitamins, and pharmaceuticals, consumers are likely to use products containing them. In food and pharmaceuticals, chelating agents are present in very low (parts per million) concentrations. DOW aminopolycarboxylate chelate products for pharmaceutical or food-contact use are high-purity products approved by the U.S. Food and Drug Administration (FDA) and are listed in the United States Pharmacopeia (USP).⁵⁶ For further details, see Exposure Potential.

- This product safety assessment discusses general health concerns for concentrated DOW aminopolycarboxylate chelate products intended for industrial settings. For specific information, refer to the product Safety Data Sheet. Eye contact with product concentrates may cause moderate to severe irritation depending on formulation. Corneal injury or permanent impairment of vision is possible. Prolonged or repeated skin contact may cause skin burns. Inhalation of vapors or dust during processing may cause irritation of the nose and throat. Large dietary doses of NTA (nitriloacetetate, trisodium salt), an impurity in some formulations, have caused urinary tract tumors in laboratory animals. There is little likelihood that NTA as an impurity in DOW chelating products would cause cancer in humans.²³ EDTA, DTPA and their sodium salts have been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation. For further details, see Health Information.

- The components of DOW aminopolycarboxylic chelate products are degradable, unlikely to accumulate in the food chain, and range from practically non-toxic to slightly to moderately toxic to aquatic organisms. For further details, see Environmental Information.

- DOW aminopolycarboxylic chelate products are stable under recommended storage and use conditions. Some products can decompose at elevated temperatures. These products react with metals, possibly resulting in flammable hydrogen gas. Avoid contact with aluminum and aluminum alloys, copper and copper alloys, nickel, and zinc. Avoid contact with oxidizing materials and strong acids and bases.² For further details, see Physical Hazard Information.

Manufacture of Product

- Capacity – Dow manufactures aminopolycarboxylic chelating agents at facilities in Freeport, Texas, USA.

- Process – Ethylenediaminetetraacetic acid (EDTA) is a widely used chelating agent. It is manufactured by the carboxymethylation of ethylenediamine. Other aminopolycarboxylic acids are produced by substituting organic polyamines or ammonia for ethylenediamine. The
structures for EDTA, diethylenetriaminepentaacetic acid (DTPA), and N-(hydroxyethyl)-ethylenediaminetriacetic acid (HEDTA) are shown below:

- **Ethylenediaminetetraacetic acid (EDTA)**
- **N-(Hydroxyethyl)-ethylenediaminetriacetic acid (HEDTA)**
- **Diethylenetriaminepentaacetic acid (DTPA)**

Product Description

Trace amounts of metal ions are present naturally in water. These dissolved metal ions cause unwanted chemical reactions in manufactured products (spoilage) and scale (mineral) build-up in water systems. Chelating agents are molecules that tie-up free metal ions in water-based solutions by forming a large three-dimensional structure around them. The major aminopolycarboxylic acid-based chelating agents are ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), and N-(hydroxyethyl)-ethylenediaminetriacetic acid (HEDTA). EDTA sodium salt accounts for 70% of the entire aminopolycarboxylic acid chelating agent market.

The Dow family of aminopolycarboxylic acid chelating agents consists of more than two dozen products. These include VERSENE™ EDTA, VERSENOL™ HEDTA, and VERSENEX™ DTPA chelating agents. These products are formulated as liquids and solids and are listed below.

- **VERSENE™ 100** chelating agent
- **VERSENE 100 EP** chelating agent
- **VERSENE 100 LN** chelating agent
- **VERSENE 100 XL** chelating agent
- **VERSENE 100E** chelating agent
- **VERSENE 100E LC** chelating agent
- **VERSENE powder** chelating agent
- **VERSENE 220** crystals chelating agent
- **VERSENE 220E** chelating agent
- **VERSENE acid** chelating agent
- **VERSENE CA** chelating agent
- **VERSENE diammonium EDTA** chelating agent
- **VERSENE NA** chelating agent
- **VERSENE NA Disodium EDTA** chelating agent
- **VERSENE NA2 Crystals**
- **VERSENE K4EDTA Chelating Agent**
- **VERSENE tetraammonium EDTA** chelating agent
- **VERSENEX™ 80** chelating agent
- **VERSENEX 80E** chelating agent
- **XUS-40864.00L developmental** chelating agent
- **VERSENEX 50% DTPA** chelating agent
- **VERSENOL™ 120** chelating agent
- **VERSENOL 120E** chelating agent
- **VERSENE DEG** chelating agent
- **VERSENE HEIDA (XUS40855.01)** chelating agent
- **VERSENEX™ 80** chelating agent
- **VERSENEX 80E** chelating agent
- **XUS-40864.00L developmental** chelating agent
- **VERSENEX 50% DTPA** chelating agent
- **VERSENOL™ 120** chelating agent
- **VERSENOL 120E** chelating agent
- **VERSENE DEG** chelating agent
- **VERSENE HEIDA (XUS40855.01)** chelating agent

**DOW™ aminopolycarboxylic acid chelates are:**

- Useful over a wide pH and temperature range
- Inert to most chemicals
- Stable in acidic and basic solutions
- Stable in low-temperature environments
- Low in toxicity

---

®Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow

Revised: September 10, 2014  The Dow Chemical Company  Page 3 of 8
Product Uses\textsuperscript{1,4}
Aminopolycarboxylic acid-based chelating agents stabilize and preserve manufactured products. DOW™ aminopolycarboxylic chelate products are used in the following applications:

- **Cleaning products** – in household, industrial, and institutional cleaning products, such as hard-surface cleaners, laundry detergents, liquid soaps, germicidal and antibacterial cleaners, and vehicle cleaners
- **Food and beverage** – to protect flavor, color, clarity, stability, and vitamin content of beverages, dressings, sauces and mayonnaise, canned vegetables, canned seafood, and pickled products
- **Metalworking** – from the preparation and cleaning of metal surfaces to finishing and plating operations
- **Oil-field applications** – during drilling, production, and recovery of oil
- **Personal care** – to increase effectiveness and improve stability in almost every type of personal-care formulation, including bath preparations, creams, oils, ointments, hair preparations, and shampoos
- **Pharmaceuticals** – to maintain potency of active ingredients and stabilize colors and flavors
- **Polymerization** – in the polymerization of suspension, emulsion, and solution polymers
- **Pulp and paper** – to protect bleach potency and control scale during paper processing
- **Scale removal and prevention** – to clean calcium and other types of scale from boilers, evaporators, heat exchangers, filter cloths, and glass-lined kettles
- **Textiles** – in all phases of textile processing especially scouring, dyeing, and color stripping
- **Water treatment (hardness control)** – to control scale-forming calcium and magnesium in open circulating/cooling systems

Exposure Potential\textsuperscript{2,3,5,6}
DOW™ aminopolycarboxylic chelate products are used in the production of industrial and consumer products. Based on the uses for these chelating agents, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in a facility that manufactures these products or in the various industrial or manufacturing facilities that use these products. They are produced, distributed, and stored in closed systems. Those working with chelating agents in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Good housekeeping and controlling of dusts are necessary for safe handling of powder formulations. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit exposure. See Health Information.
- **Consumer exposure to products containing DOW™ aminopolycarboxylic acid chelates** – Dow does not sell these materials for direct consumer use; however, consumers are likely to use products containing them. Chelating agents are common in foods, juices, soft drinks, shampoos, lotions, vitamins, and pharmaceuticals. In food and pharmaceuticals, chelating agents are present in very low (parts per million) amounts. DOW chelating agents for food-contact or pharmaceutical use are high-purity products approved by the U.S. Food and Drug Administration (FDA) and United States Pharmacopeia (USP). See Health Information.
- **Environmental releases** – DOW™ aminopolycarboxylic chelate products may be released into the environment during use. Biodegradation and photodegradation are expected. In the event of an industrial spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. For small spills, absorb with noncombustible absorbents such as dirt or sand. Collect recovered material in suitable and properly labeled containers. See Environmental, Health, and Physical Hazard Information.
Product Safety Assessment: DOW™ Aminopolycarboxylic Chelate Products

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Evacuate personnel upwind of spill. Spilled products can be slipping hazards. Only trained and properly protected personnel must be involved in clean-up operations. Use appropriate safety equipment. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Keep people away. Isolate the fire and deny unnecessary entry. Extinguish all ignition sources. To extinguish combustible residues of these products, use water fog, carbon-dioxide or dry-chemical extinguishers, or foam. For solid formulations, a dust explosion hazard may result from forceful application of fire-extinguishing agents. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

**Back to top**

**Health Information**

Health information for DOW™ aminopolycarboxylic chelate products is summarized on the relevant Safety Data Sheets. Health risks associated with individual products may vary based on their formulation or concentration. These products may contain minor components or additives that have additional health risks. The Safety Data Sheet is the preferred source for specific health information. This product safety assessment discusses general health concerns for concentrated DOW aminopolycarboxylate chelate products intended for industrial settings.

**Eye contact** – Eye contact may cause moderate to severe irritation with corneal injury, possibly resulting in permanent impairment of vision, even blindness. Chemical burns to the eye may occur.

**Skin contact** – Prolonged skin contact may cause moderate irritation with local redness. In some cases, the response may be more severe. Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. The response may be more severe if the material is confined under clothing or gloves or if the skin is scratched or cut. Prolonged skin contact with these products is not likely to result in absorption of harmful amounts.

**Inhalation** – Inhalation of concentrated product dusts, mist, or aerosols during manufacturing may cause irritation of the upper respiratory tract (nose and throat). EDTA and DTPA chelating agents are classified in the European Union (EU) as harmful via inhalation. They cause severe irritation in the deep respiratory tract upon exposure to very concentrated liquid aerosols or very finely powdered versions of chelants with average particle size of < 2-5 micrometers in diameter.

**Ingestion** – These products have low toxicity if swallowed. However, swallowing may result in burns to the mouth and throat. Aspiration into the lungs may occur during vomiting, causing tissue damage or lung injury.

**Repeated exposure** – These formulations contain minor impurities that have adversely affected the kidneys and urinary tract in animals dosed repeatedly with large amounts. Specifically, deposition of calcium salts in urinary tract tissues occurred.

**Cancer information** – Large dietary doses of NTA (nitriloacetate, trisodium salt) an impurity in some formulations, have caused urinary tract tumors in laboratory animals. However, there is little likelihood that NTA as an impurity in DOW chelating products would cause cancer in humans. The trisodium salt of EDTA did not cause cancer in laboratory animals. However, VERSENE™

---

©™Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow

Revised: September 10, 2014   The Dow Chemical Company   Page 5 of 8
powder chelating agent contains formaldehyde at a reportable level (greater than 0.1 weight percent). Formaldehyde is classified by IARC as a human carcinogen.

**Developmental Information** – EDTA, DTPA and their sodium salts have been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation. DTPA is provisionally classified as a category 2 developmental toxicant according to the Globally Harmonized System in the EU.

**Genetic Information** – Most data indicate that EDTA and its salts are not mutagenic. Minimal effects reported are likely due to trace metal deficiencies resulting from chelating by EDTA.

For more information, see the relevant Safety Data Sheet.

**Environmental Information**

Environmental information for DOW™ aminopolycarboxylate chelate products is summarized on the relevant Safety Data Sheets. It is important to note that environmental properties associated with individual products may vary based on their formulation or intended use. The Safety Data Sheet is the preferred source for specific environmental information. An overview of environmental information for the major component of these products appears below.

DOW aminopolycarboxylate chelate products are formulated as liquids or solids. They have very low volatility and high water solubility. Once introduced, they will have a tendency to remain in water. They have minimal tendency to bind to soil or sediment.

DOW aminopolycarboxylate chelate products are unlikely to persist in the environment. They are susceptible to biodegradation and photodegradation, which suggests that they will be removed from water and soil environments.

DOW aminopolycarboxylate chelate products are not likely to accumulate in the food chain (bioconcentration potential is low) and range from practically nontoxic to slightly to moderately toxic to aquatic organisms on an acute basis.

For more information, see the relevant Safety Data Sheet.

**Physical Hazard Information**

DOW™ aminopolycarboxylic chelate products are stable under recommended storage and use conditions. Some products can decompose at elevated temperatures. These products react with metals, possibly resulting in flammable hydrogen gas. Avoid contact with aluminum and aluminum alloys, copper and copper alloys, nickel, and zinc. Avoid contact with oxidizing materials and strong acids and bases. Powder formulations can be a dust-explosion hazard, and spilled powder can be a slipping hazard. Practice good housekeeping for the control of dusts.

For more information, see the relevant Safety Data Sheet.

**Regulatory Information**

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ aminopolycarboxylic chelate products. These regulations may vary by city, state, country,
or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

Additional Information

- Safety Data Sheet (http://www.dow.com/assistance/dowcig.htm)
- Contact Us (www.dow.com/versene/contact/index.htm)
- VERSENE Food Grade EDTA Technical Data Sheet, the Dow Chemical Company, Form No. 113-01325-1201AMS, December 2001, (http://www.dow.com/PublishedLiterature/dh_0040/0901b80380040b68.pdf?filepath=versene/pdfs/noreg/113-01325.pdf&fromPage=GetDoc)

For more business information about DOW chelating agents, visit the Dow VERSENE™ chelating agents web site at www.versene.com.

References

1 DOW™ Chelating Agents: Effective, Economical Metal Ion Control – VERSENE™, VERSENEX™, and VERSENOL™ Chelating Agents, The Dow Chemical Company, Form No. 113-01259-1001AMS
2 VERSENE™ Powder Chelating Agent Material Safety Data Sheet, The Dow Chemical Company
3 VERSENEX™ 50% Chelating Agent Material Safety Data Sheet, The Dow Chemical Company
4 Dow VERSENE Chelating Agents – Applications (http://www.dow.com/versene/app/index.htm)
5 VERSENE Food Grade EDTA Technical Data Sheet, the Dow Chemical Company, Form No. 113-01325-1201AMS
6 VERSENE™ NA Edetate Disodium USP: Effective Stabilizer/Preservative for Pharmaceutical Liquids, Technical Data Sheet, The Dow Chemical Company, Form No. 113-01327-0306-rlr
8 VERSENE NTA 148 Chelating Agent Safety Data Sheet, The Dow Chemical Company
9 VERSENOL 120 Chelating Agent Material Safety Data Sheet, The Dow Chemical Company

®™Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow
NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

The information herein is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Dow be responsible for damages of any nature whatsoever resulting from the use of or reliance upon the information herein or the product to which that information refers.

Nothing contained herein is to be construed as a recommendation to use any product, process, equipment or formulation in conflict with any patent, and Dow makes no representation or warranty, express or implied, that the use thereof will not infringe any patent.

NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

Dow makes no commitment to update or correct any information that appears on the Internet or on its World-Wide Web server. The information contained in this document is supplemental to the Internet Disclaimer, www.dow.com/homepage/term.asp.

Form No. 233-00894-MM-0914X

®Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow