Product Safety Assessment

**DOW™ Quat 188 Cationic Reagent**

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**Names**

- CAS No. 3327-22-8
- 1-Propanaminium, 3-chloro-2-hydroxy-N,N,N-trimethyl-, chloride
- 3-Chloro-2-hydroxy-N,N,N-trimethyl-1-propanaminium chloride
- (3-Chloro-2-hydroxypropyl)trimethylammonium chloride (CHPTAC)
- DOW™ Quat reagents reagent
- DOW™ Quat 188 cationic reagent, 69% active
- DOW™ Quat 188 cationic reagent, 65% active
- DOW™ Quat 188 cationic reagent

**Product Overview**

- DOW™ Quat cationic reagents are aqueous solutions of monomer (3-chloro-2-hydroxypropyl) trimethylammonium chloride (CHPTAC). DOW Quat 188 reagents are clear, odorless liquids. DOW Quat 188 reagents are used to modify natural and synthetic polymers into quaternary ammonium compounds. It is used industrially for chemical processing of personal-care products, pulp and paper, textiles, and for water management. For further details, see Product Description and Product Uses.
- Occupational exposure is possible at production facilities or at facilities that use DOW Quat 188 cationic reagents in manufacturing processes. Potential for exposure is minimized through engineering controls and the use of personal protective equipment. Because these materials are industrial chemicals, direct consumer contact is not likely. For further details, see Exposure Potential.
- Eye contact with cationic reagents such as DOW Quat 188 reagents may cause moderate irritation, although corneal injury is unlikely. Prolonged skin contact is not likely to cause significant irritation or result in absorption of harmful amounts. In most commercial uses, these products are converted to epoxides, which are skin sensitizers. Do not intentionally mist the epoxide. At room temperature, exposure to vapor is minimal due to low volatility. For further details, see Health Information.
- DOW Quat 188 reagents are thermally stable at typical use temperatures. Avoid temperatures above 150°C (302°F). Avoid contact with amines or ammonia and unintended contact with strong acids and strong bases. For further details, see Physical Hazard Information.

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Manufacture of Product

- **Process** – DOW™ Quat 188 reagents are produced from the reaction of epichlorohydrin and trimethylamine hydrochloride. The reaction is shown below:

![Chemical Structure of Epichlorohydrin, Trimethylamine Hydrochloride, and Quat 188]

Product Description

DOW™ Quat 188 reagents are aqueous solutions of (3-chloro-2-hydroxypropyl)trimethylammonium chloride. These cationic reagents are clear in color, and are odorless liquids. These products are completely miscible in water and largely insoluble in hydrocarbons. Typical active salt concentrations range from about 65–70%. In most commercial applications, these products are converted into epoxides through the addition of a strong base (NaOH). It is the epoxide that reacts with polymers such as starch.  

Product Uses

DOW™ Quat 188 reagents are used to modify natural and synthetic polymers into quaternary ammonium compounds. Quaternary ammonium compounds are cationic, meaning they carry a positive electrical charge. Cationic polymers are useful as dry-strength additives for paper, retention aids, flocculants, electro-conductive resins, asphalt emulsifiers, emollients, and surfactants.

DOW Quat 188 is used in the following industries:

- **Paper** – Quaternary-modified cationic starches are used as wet-end additives to increase dry strength and also as binders for coatings.
- **Personal care** – Cationic polymers enhance a product’s cling to hair or skin. They are used in hair-conditioning formulations, and as emollients and humectants in creams.
- **Oil and Gas** – Cationic reagents used in formulation of drilling muds.

Exposure Potential

DOW™ Quat cationic reagents are used in the production of industrial and consumer products. Based on these uses, the public could be exposed through:

- **Workplace exposure** – These products are manufactured in closed systems using engineering controls that prevent the escape of liquid or vapors and minimize the potential for release to the environment. The chance of exposure is further reduced through the use of personal protective equipment. Occupational exposure is possible at production facilities or at facilities that use these products as cationic reagents. Facilities that manufacture or use these products should have a thorough training program for employees, appropriate ventilation and work processes, and safety equipment in place to limit unnecessary exposure. Do not intentionally mist the epoxide. See Health Information.
- **Consumer exposure to DOW™ Quat cationic reagents** – These products are not sold for direct consumer use; however, DOW Quat 188 is used in the manufacture of personal-care products. These cationic reagents react with other chemicals and components during the manufacturing process and are not present in their original form in the final product. Therefore consumer exposure to these reagents is not expected. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. For small spills, clean up with absorbent material such as cellulose, clay, sand, Slick-wik, Zorb-all, or Hazorb. Collect in suitable and properly labeled containers and in accordance with applicable government regulations. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, isolate the area. Dike the area to contain the spill. Transfer material into suitable and properly labeled containers and use appropriate safety equipment and address the situation in accordance with applicable government regulations. See Environmental and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

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**Health Information**

**Eye and Skin Contact** – Eye contact with these products may cause moderate irritation, although corneal injury is unlikely. Prolonged skin contact is not likely to cause significant irritation, or result in absorption of harmful amounts. In most commercial uses, this product is converted to an epoxide which is a skin sensitizer.

**Inhalation** – Exposure to vapors is unlikely due to physical properties. Do not intentionally mist the epoxide.

**Ingestion** – This material has low toxicity if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.

**Cancer Information** – In most commercial uses, these products are converted to an epoxide intermediate. At the highest dose tested, such epoxide caused skin and mammary tumors in a long-term skin painting study in mice.

For more information, see the relevant Safety Data Sheet.

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**Environmental Information**

Based on stringent OECD test guidelines, DOW™ Quat cationic reagents cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions. Degradation is expected in the atmospheric environment within minutes to hours.

No bioconcentration is expected because of the relatively high water solubility. The potential for mobility in soil is very high.

DOW Quat cationic reagents are slightly toxic to aquatic organisms on an acute basis.
Physical Hazard Information

DOW™ Quat cationic reagents are thermally stable at typical use temperatures. Avoid exposure to temperatures above 150°C (302°F). Thermal decomposition products can include chloroacetone, hydrogen chloride, methyl chloride, trimethylamine, and other compounds. Do not store this material in unlined metal containers or tanks.

Avoid contact with amines or ammonia and unintended contact with strong acids and strong bases.

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™ Quat 188 reagents. 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 (request using Contact Us at http://www.dow.com/quat/contact.htm)
- Contact Us (http://www.dow.com/quat/contact.htm)
- Dow Answer Center – Quaternaries (https://dow-answer.custhelp.com/app/answers/list/p/1599/c/0/search/1, search Products, then Quaternaries)
- Quat 188 65% Cationic Monomer Product Technical Data Sheet, The Dow Chemical Company, Form No. 123-00001-0409 (http://www.dow.com/quat/quat1.htm)
- Quat 188 69% Cationic Monomer Product Technical Data Sheet, The Dow Chemical Company, Form No. 123-00008-0409 (http://www.dow.com/quat/quat3.htm)

References

1. DOW™ Quat 188 Cationic Reagent website – http://www.dow.com/quat/
2. DOW™ QUAT 188 Reagent Material Safety Data Sheet, The Dow Chemical Company
3. The Safe Handling of DOW™ Quat 188, The Dow Chemical Company, (slide presentation)
4. Dow Answer Center – https://dow-answer.custhelp.com/app/answers/list/p/1599/c/0/search/1, search Products, then Quatamaries
5. Quat 188 Cationic Monomer 65%Technical Data Sheet, The Dow Chemical Company, Form No. 123-00001-0409

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.

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