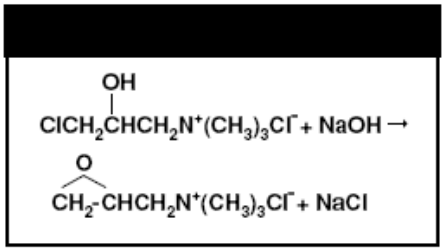
Quat 188 69% Cationic Monomer

Introduction	**A Cationic Monomer** Quat 188, a product of The Dow Chemical Company, is an aqueous solution of N-(3-chloro-2-hydroxypropyl) trimethylammonium chloride. It is an effective cationic monomer used to modify natural and synthetic polymers to produce quaternary ammonium compounds with a broad array of end uses.	
Applications	The reaction of Quat 188 with select natural and synthetic polymers results in cationically charged polymers. The addition of the quaternary ammonium group on the product results in increased polarity, hygroscopicity and affinity for anionic materials. It is this interaction between the positively charged nitrogen and the many negatively charged materials that makes Quat 188 modified products suitable as dry strength additives for paper, retention aids, flocculants, electroconductive resins, antistatic agents, fabric softeners, asphalt emulsifiers, emollients, and in various surfactant applications. Introducing Quat 188 into polymeric systems imparts three important characteristics: **1. Increased Cationic Polarity.** Cationic groups improve adhesion to polar substrates. **2. Increased Affinity for Anionic Materials.** Polymers modified with Quat 188 have pendant cationic groups and will associate with materials containing negative counter ions, such as carboxyl, sulfonate, and many other negatively charged substrates. **3. Increased Hygroscopicity.** Polymers with cationic groups display increased water solubility as a result of the highly water soluble quaternary ammonium group. Polymers generally not soluble in water can thus be given some degree of water solubility. **To learn more.** For additional information, to obtain the current Material Safety Data Sheet, or to obtain samples, call or fax the number for your area listed on the second page of this document.	
Properties	Typical Analysis of 69 % Quat 188	
	Active content, %	**69**
	1, 3-Dichloropropanol, ppm	**<20**
	Epichlorohydrin, ppm	**<5**
Properties	Typical Properites of 69 % Quat 188 Solutions	
	Visual Appearance	**Clear**
	Density @ 20°C **g/ml** **lb/gal**	 **1.17** **9.77**
	Viscosity, cst **-20°C** **-10°C** **0°C** **10°C** **20°C** **30°C** **40°C**	 **355.8** **149.2** **70.7** **38.9** **23.1** **14.8** **10.5**
	Freezing point, °C	**-39**
	Flash point	**None**

Epoxide Reactions

An equivalent amount of a strong base will convert Quat 188 to its epoxide form: 2,3-epoxypropyl-trimethylammonium chloride.



This occurs quite readily and is the basis for most of the commercially important reactions. A few examples include:

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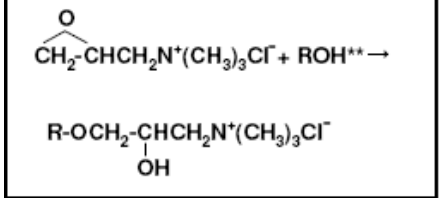

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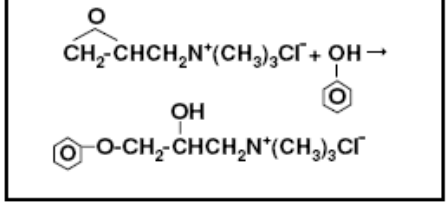

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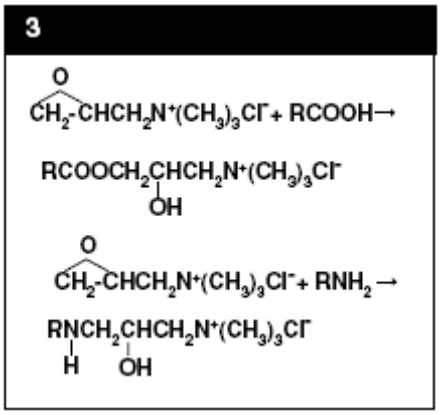

Under conditions of heat and hydrolysis, the following by-products may result:

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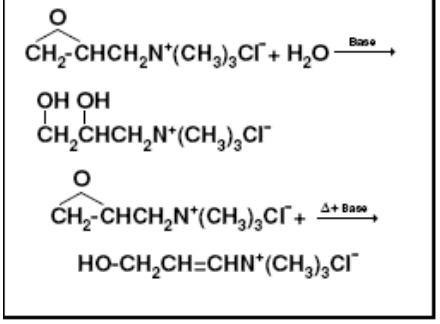
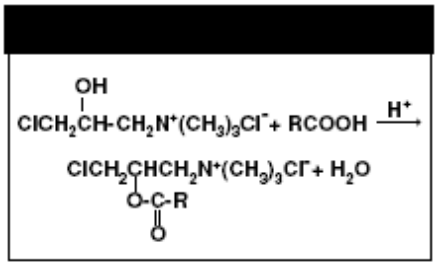


**Includes natural cellulosic materials such as starch, flour, guar gum, cotton, and synthetic materials such as METHOCEL™ cellulose ethers, polyvinyl alcohol, etc.

1. *E.F. Paschall, U.S. Patent 2,876,217 to Corn Products Company (1959).*
2. *The Dow Chemical Company, unpublished results.*
3. *U.S. Patents 3,329,706 and 3,342,840 to Shell Oil Company, I. Sobolev, (1967).*
4. *J. Org. Chem., 35, 2059 (1970), J.D. McClure.*
5. *The Dow Chemical Company, unpublished results.*
6. *British Patent 1,112,912 to Rohm and Haas Co., David H. Clemens*

Chlorohydrin Reactions

Reactions can easily proceed via the chlorohydrin form of Quat 188. Relatively mild conditions (<50°C) are necessary to attain good yields. Depending on the reagent, reaction will occur on either the hydroxyl or chloride side. Examples include:



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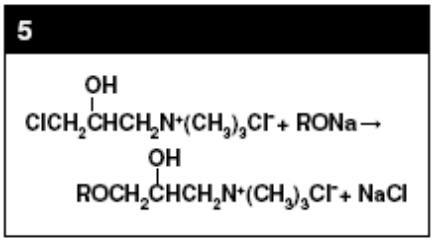

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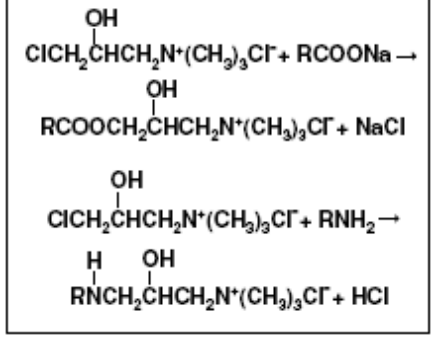

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