



## KATHON™ CG Preservative

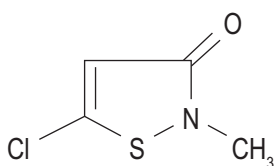
A Highly Effective, Broad Spectrum Preservative for Rinse-Off Haircare and Rinse-Off Skin Care Products

### General

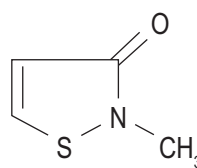
Dow has driven the progress of isothiazolinone chemistry based on our customers' evolving needs. Dow's goal is to offer our personal care customers with much more than a preservative using our internal expertise in applying this chemistry and supporting it with extensive toxicological and environmental information and knowledge.

The active ingredients in KATHON™ CG Preservative are isothiazolinones identified by the INCI names Methylchloroisothiazolinone and Methylisothiazolinone.

### Structure



Methylchloroisothiazolinone  
C<sub>4</sub>H<sub>4</sub>ClNOS  
CAS No.: 26172-55-4



Methylisothiazolinone  
C<sub>4</sub>H<sub>5</sub>NOS  
CAS No.: 2682-20-4

### Formulation/ Stability

KATHON™ CG Preservative is a precise formulation of active ingredients and inert salts in an aqueous solution. Each batch of KATHON CG is manufactured to exact specifications and a certificate of analysis can be provided with each order. This stable formulation shown below has a four-year shelf life.

KATHON™ CG Preservative	
<b>Active Ingredients:</b>	
5-chloro-2-methyl-4-isothiazolin-3-one	1.13%*
2-methyl-4-isothiazolin-3-one	0.37%*
<b>Total</b>	<b>1.50%</b>
<b>Inert Ingredients:</b>	
Magnesium salts (chloride and nitrate)	23.00%
Water	to 100.00%

\*These are typical values and do not constitute specifications.

### Physical Properties

The following are typical properties of KATHON™ CG Preservative; **they are not to be considered product specifications.**

Appearance, visual: ..... Clear liquid  
 Color: ..... APHA ≤ 100  
 Odor: ..... Mild  
 Specific gravity @ 25°C: ..... 1.21  
 pH (as manufactured): ..... 1.7 - 3.7  
 Solubility: ..... Totally miscible in water, lower alcohols and glycols  
 and has low solubility in hydrocarbons

## **Applications**

- Shampoos
- Conditioners
- Body wash / shower gels
- Liquid hand soaps
- Cosmetic ingredients such as surfactants, rheology modifiers, silicone emulsions, opacifiers, etc.

## **We Supply More Than a Preservative**

In the current regulatory climate, where more and more data are required by regulatory authorities, it is important not only to choose a high purity and consistent quality preservative, but also the right supplier who is able to give you the technical, regulatory and commercial support that you need. Dow has more than 30 years of experience with isothiazolinone chemistry and over 100 patents. To support the use of our products, we maintain the following on KATHON™ CG Preservative:

- Regulatory data
- Extensive toxicological databases
- Environmental fate database that is continually updated
- Safe handling expertise that can help you in your manufacturing facilities
- Expertise with isothiazolinone chemistry
- More than 100 patents obtained since the 1960s
- Public relations/media expertise and support

## **Special Features and Benefits**

- Global approvals for use as a preservative in rinse-off personal care formulations\*
- Simple water-based formulation for ease of use in manufacture
- Compatible with a wide range of personal care products and ingredients
- Effective over the pH range typical for personal care products
- No color or odor imparted to personal care products
- Very effective at low use levels offering a cost to treat advantage
- Supported by more than 30 years of safe and effective use
- Excellent environmental profile: rapidly degrades, does not bioaccumulate and is nonpersistent in the environment
- Does not release formaldehyde

\*Customers should verify the appropriate legislation by jurisdiction.

## **Recommended Use Rates**

Typically, personal care rinse-off products are effectively preserved in the range of 0.05% up to 0.1% KATHON™ CG Preservative by weight of product supplied (7.5 to 15 parts per million active ingredient). The maximum use level for KATHON CG is 0.1%. Because the components of personal care formulations vary considerably and may have an impact on the effect of preservatives, we urge each manufacturer to confirm the efficacy and stability of KATHON CG in use.

## **Microbiological Properties/Activity**

KATHON™ CG Preservative exhibits excellent antimicrobial activity against Gram-positive and Gram-negative bacteria, molds and yeasts. The following summarizes the minimum inhibitory concentrations of KATHON CG for a range of bacteria, yeasts and molds tested in liquid media.

KATHON™ CG Preservative has been tested for efficacy against a variety of microorganisms. Claims of efficacy against specific organisms may not be approved in all regulatory jurisdictions. It is the responsibility of the user to confirm all applicable approvals are in place prior to product use.

The data demonstrate the broad spectrum activity of KATHON CG, but must not be taken as recommended use concentrations. The microorganisms listed are not necessarily involved in the contamination of personal care products.

Organism	ATCC No.	KATHON™ CG Preservative (as supplied, ppm)	Active Ingredient (ppm)
<b>Bacteria*</b>			
<b>Gram-Positive</b>			
<i>Bacillus cereus var. mycooides</i>	(R&H No. L5)	150	2
<i>Bacillus subtilis</i>	(R&H No. B2)	150	2
<i>Brevibacterium ammoniagenes</i>	6871	150	2
<i>Sarcina lutea</i>	9341	300	5
<i>Staphylococcus aureus</i>	6538	150	2
<i>Staphylococcus epidermidis</i>	155	150	2
<i>Streptococcus pyogenes</i>	624	600	9
<b>Gram-Negative</b>			
<i>Achromobacter parvulus</i>	4335	150	2
<i>Alcaligenes faecalis</i>	8750	150	2
<i>Burkholderia (Pseudomonas) cepacia Gibraltar</i>	165	50	0.75
<i>Enterobacter aerogenes</i>	3906	300	5
<i>Escherichia coli</i>	11229	300	5
<i>Flavobacterium suaveolens</i>	958	600	9
<i>Proteus vulgaris</i>	8427	300	5
<i>Pseudomonas aeruginosa</i>	15442	300	5
<i>Pseudomonas fluorescens</i>	13525	150	2
<i>Pseudomonas oleoverans</i>	8062	300	5
<i>Salmonella typhosa</i>	6539	300	5
<i>Shigella sonnei</i>	9292	150	2
<b>Fungi*</b>			
<i>Aspergillus niger</i>	9642	600	9
<i>Aspergillus oryzae</i>	10196	300	5
<i>Candida albicans (yeast)</i>	11651	300	5
<i>Chaetomium globosum</i>	6205	600	9
<i>Gliocladium fimbriatum</i>	(QM 7638)	600	9
<i>Mucor rouxii</i>	(R&H L5-83)	300	5
<i>Penicillium funiculosum</i>	9644	300	5
<i>Penicillium variable (glaucum)</i>	(U.S.D.A.)	150	2
<i>Phoma herbarum (pigmentivora)</i>	12569	150	2
<i>Pullularia (Aureobasidium) pullulans</i>	9348	300	5
<i>Rhizopus stolonifer</i>	10404	300	5
<i>Rhodotorula rubra (yeast)</i>	9449	150	2
<i>Saccharomyces cerevisiae (yeast)</i>	2601	150	2
<i>Trichophyton mentagrophytes (interdigitale)</i>	9533	300	5

\*Bacteriostatic and fungistatic tests performed by serially diluting test compounds in trypticase soy broth and 1:100 inoculation with 24-hour broth cultures of the test bacterium or a fungal spore suspension prepared from 7-14 day culture slants washed with 7 mL of deionized water. Minimum inhibitory concentration levels determined visually after 2 days incubation at 37°C for bacteria and 28-30°C for fungi.

**KATHON™ CG  
Preservative  
Performance  
in Rinse-Off  
Applications**

KATHON™ CG Preservative microbiological performance was assessed with a 3-cycle challenge test which uses separate pools of bacteria and fungi. Dow's method is a modification of the Personal Care Product Council (PCPC) preservative efficacy test.

**Bacteria**

Product	KATHON™ CG Preservative (% Product)	Bacteria – Estimated CFU/g after day:		
		7	14	21
Shampoo, pH 6.0	0 (Unpreserved)	10 <sup>7</sup>	10 <sup>7</sup>	10 <sup>8</sup>
	0.10	<10	<10	<10
Body Wash, pH 6.8	0 (Unpreserved)	10 <sup>8</sup>	10 <sup>8</sup>	10 <sup>8</sup>
	0.05	<10	<10	<10
Hand Soap, pH 5.3	0 (Unpreserved)	10 <sup>6</sup>	10 <sup>8</sup>	10 <sup>8</sup>
	0.05	<10	<10	<10

**Fungi**

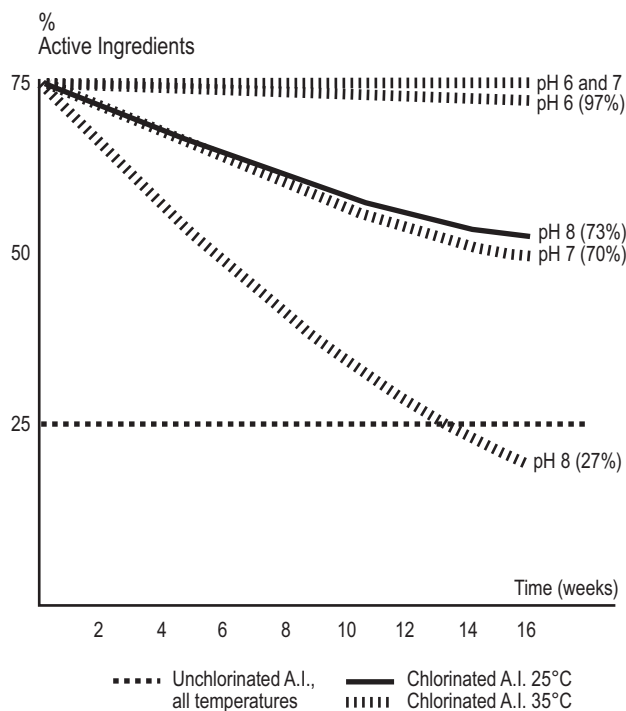
Product	KATHON™ CG Preservative (% Product)	Fungi – Estimated CFU/g after day:		
		7	14	21
Shampoo, pH 6.0	0 (Unpreserved)	10 <sup>3</sup>	10 <sup>7</sup>	10 <sup>4</sup>
	0.10	<10	<10	<10
Body Wash, pH 6.8	0 (Unpreserved)	10 <sup>7</sup>	10 <sup>8</sup>	10 <sup>8</sup>
	0.05	<10	<10	<10
Hand Soap, pH 5.3	0 (Unpreserved)	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>3</sup>
	0.05	<10	<10	<10

**Chemical Stability  
of KATHON™ CG  
Preservative in Use**

KATHON™ CG Preservative has an established history of successful use as a preservative in a wide range of rinse-off personal care products. However, there are some circumstances in which we advise potential users to confirm preservative active ingredient stability. These are outlined below, together with recommendations on how to optimize stability. In those instances where KATHON CG stability cannot be improved, we recommend evaluating Dow's NEOLONE™ preservatives.

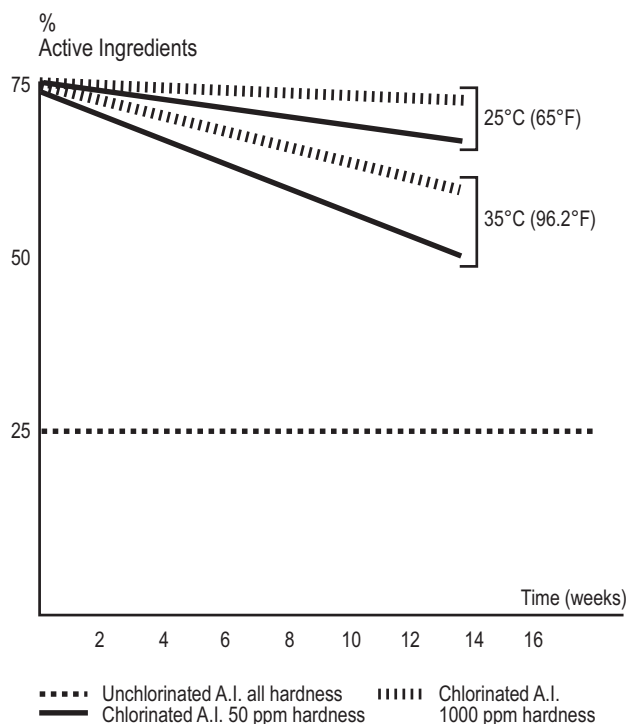
**Temperatures and pH:** As a general rule, a rise in temperature accelerates the rate of degradation of chemicals. As demonstrated in Figure 1, KATHON CG Preservative is no exception. We recommend that temperatures in excess of 50°C should be avoided during manufacturing once the preservative has been incorporated into the formulation. Stability at ambient temperature is very much formulation dependent. Generally, KATHON CG is stable up to a pH of 8.0 over the lifetime of personal care products.

**Figure 1**  
**Stability of**  
**KATHON™ CG**  
**Preservative in**  
**Deionized Water**  
**versus pH at**  
**25° and 35°C**



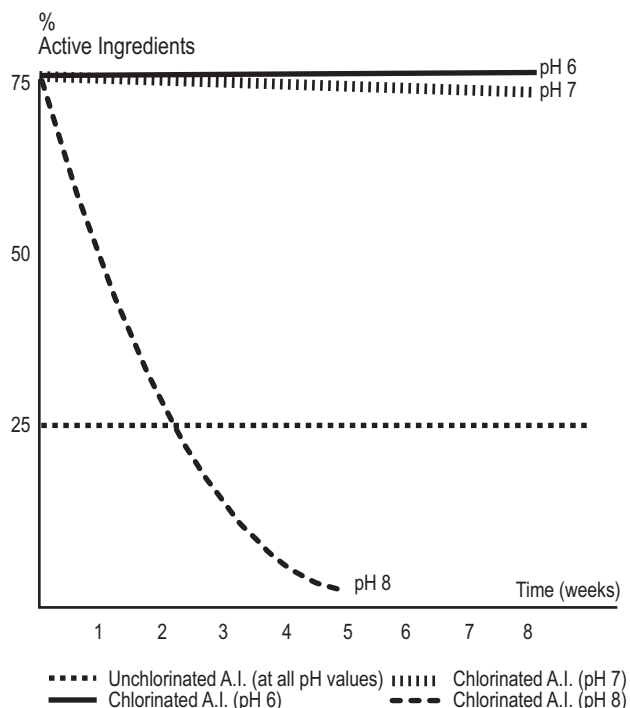
**Water Hardness:** The presence of calcium and magnesium in hard water has a notable positive impact on the stability of KATHON™ CG Preservative, as shown in Figure 2. KATHON CG has been found to remain stable in the presence of hard water under circumstances in which breakdown would normally be anticipated.

**Figure 2**  
**Stability of**  
**KATHON™ CG**  
**Preservative**  
**Versus Water**  
**Hardness at pH 8**



**Amines and Amine Derivatives:** The presence of amine impurities in raw materials has a deleterious effect on the stability of KATHON CG Preservative. Secondary amines, in particular, show severe antagonism, but a simple reduction in pH to below 7, converting the amine to its acid salt, normally resolves the problem as demonstrated in Figure 3.

**Figure 3**  
**Stability of**  
**KATHON™ CG**  
**Preservative in a**  
**2.5% Cocamide**  
**Diethanolamine**  
**Aqueous Solution**  
**at 35°C and**  
**Various pH Values**



**Reducing Agents:** Some reducing agents are detrimental to isothiazolinone stability. Sulfated and sulfonated surfactants often contain residual sulfite or bisulfite, which can react with KATHON™ CG Preservative. We have found that use levels of the preservative are stable in the presence of up to about 25 ppm bisulfite (expressed as SO<sub>3-2</sub>). Stability of KATHON CG in surfactants where the level is greater than 25 ppm can be optimized by treating the surfactant with a suitable oxidizing agent prior to adding KATHON CG.

**Thiols:** Thiols such as cysteine and zinc pyrithione are detrimental to the stability of KATHON CG Preservative. Proteins or protein hydrolysates may contain thiols which could be available to react with KATHON CG.

### Formulation Considerations

Following our recommendations in formulating with KATHON™ CG Preservative will enhance stability and control preservative cost.

It is important to follow these general guidelines when possible:

- Slightly acidic pH values are preferred
- Neutralize free diethanolamine when present (with citric acid for example)
- Eliminate residual SO<sub>2</sub> when present, using a suitable oxidizing agent
- Avoid high temperatures. During manufacture, add KATHON CG when the temperature is at or below 50°C
- Stearic and phosphoric acids can react with magnesium stabilizers in KATHON CG to form insoluble magnesium stearate and magnesium phosphate salts
- Use hard water (better than deionized water) when possible
- Avoid formulations in which cysteine and zinc pyrithione are present
- KATHON CG stability should be evaluated in products containing protein hydrolysates to ensure preservative stability is adequate

## **Analytical Procedures**

### **High-Performance Liquid Chromatography (HPLC)**

HPLC analysis is the preferred method for determining the low use levels of KATHON™ CG Preservative. This method can be used to determine KATHON CG active ingredient levels in many personal care products.

If you require detailed information on HPLC methods, please contact your Dow representative.

## **Handling Precautions**

### **Storage**

Store products in tightly closed original containers at temperatures recommended on the product label.

### **Disposal Considerations**

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow representative for more information.

## **Product Stewardship**

When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet (SDS) and country-specific product label to ensure the intended use is within the scope of approved uses. Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## **Customer Notice**

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including Safety Data Sheets (SDS), should be consulted prior to use of Dow products. Current Safety Data Sheets are available from Dow.

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