

# Kathon® CG Preservative

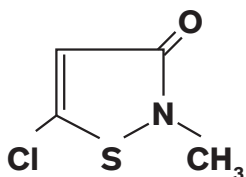
A highly effective, broad spectrum preservative for rinse-off haircare and rinse-off skin care products

## General

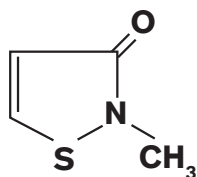
LANXESS has driven the progress of isothiazolinone chemistry based on our customers' evolving needs. The goal of LANXESS is to offer our personal care customers with much more than a preservative using our internal expertise in applying this chemistry and supporting it with extensive toxicological and 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 Preservative is manufactured to exact specifications and a certificate of analysis can be provided with each order.

This stable formulation shown below has a two-year shelf life.

**Table 1 - Chemical composition**

Kathon® CG Preservative	
Active Ingredients	
5-Chloro-2-methyl-4-isothiazolin-3-one	1.13%*
2-Methyl-4-isothiazolin-3-one	0.37%*
Total	1.50%
Inert Ingredients	
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:	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. LANXESS has 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 Preservative 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 Preservative 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 Preservative, but must not be taken as recommended use concentrations. The microorganisms listed are not necessarily involved in the contamination of personal care products.

**Table 1 - Minimum inhibitory concentrations (MIC) of Kathon® CG Preservative.**

Organism	ATCC No	Kathon® CG preservative (as supplied, ppm)	Active Ingredient (ppm)
Bacteria*			
<b>Gram-Positive</b>			
<i>Bacillus cereus</i> var. <i>mycoides</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</i> Gibraltar	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</i> (yeast)	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</i> (yeast)	9449	150	2
<i>Saccharomyces cerevisiae</i> (yeast)	2601	150	2

\* 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 10 of bacteria and fungi. LANXESS's method is a modification of the Personal Care Product Council (PCPC) preservative efficacy test.

**Table 2 - 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

**Table 2 - Fungi**

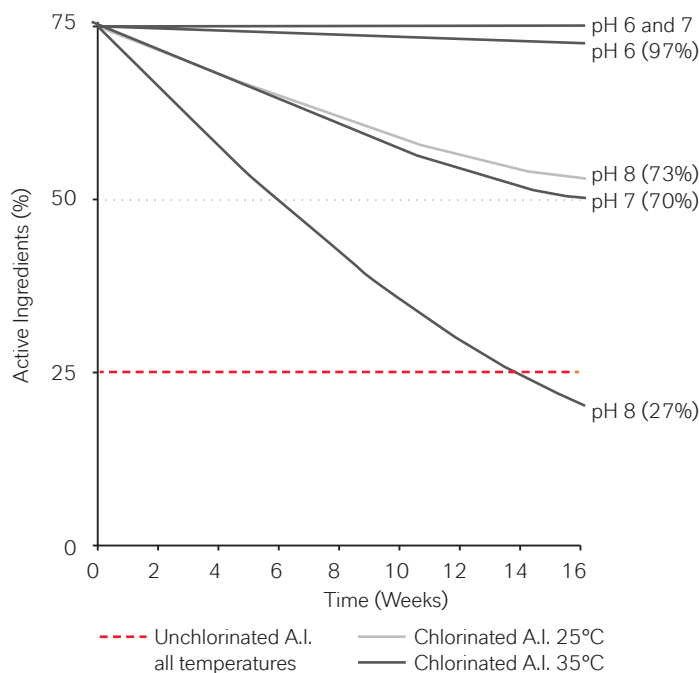
Product	Kathon® CG Preservative (% Product)	Fungi – Estimated CFU/g after day:		
		7	14	21
Shampoo, pH 6.0	0 (Unpreserved)	10 <sup>3</sup>	10 <sup>7</sup>	10 <sup>4</sup>
	0.10	<10	<10	<10
Body Wash, pH 6.8	0 (Unpreserved)	10 <sup>7</sup>	10 <sup>8</sup>	10 <sup>8</sup>
	0.05	<10	<10	<10
Hand Soap, pH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

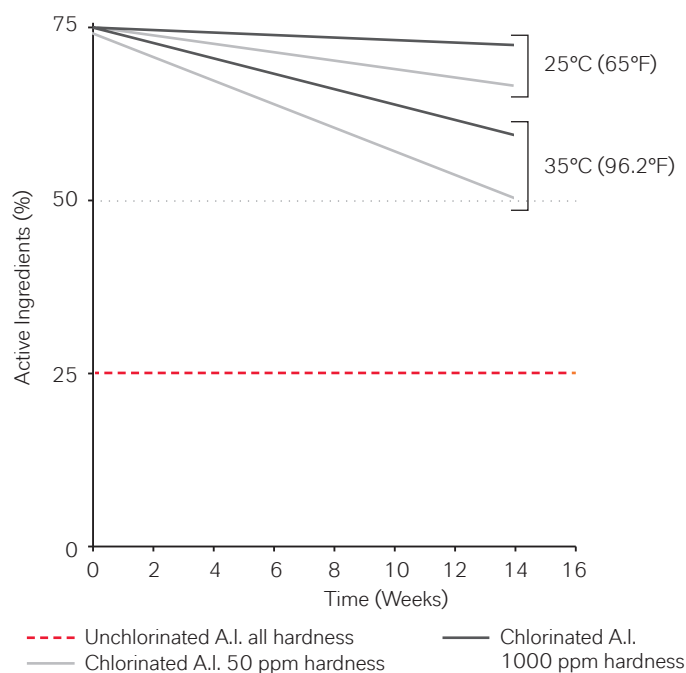
Kathon® CG Preservative has an established history of successful use as a preservative in a wide range of rinse-off personal care products. However, there are some circumstances in which we advise potential users to confirm preservative active ingredient stability. These are outlined below, together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



**Figure 2: Stability of Kathon® CG Preservative versus Water Hardness at pH 8**

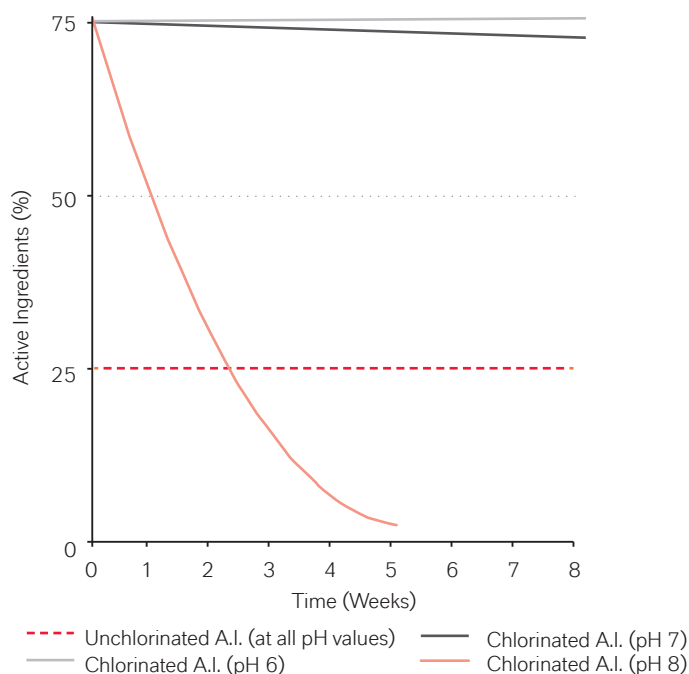


**Water Hardness:** The presence of calcium and magnesium in hard water has a notable positive impact on the stability of Kathon® CG Preservative, as shown in Figure 2. Kathon® CG Preservative has been found to remain stable in the presence of hard water under circumstances in which breakdown would normally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

**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.

**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  $\text{SO}_3^{2-}$ ). Stability of Kathon® CG Preservative 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 Preservative.

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



**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 Preservative.

### 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 Preservative when the temperature is at or below 50°C
- Stearic and phosphoric acids can react with magnesium stabilizers in Kathon® CG Preservative 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 Preservative 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 Preservative active ingredient levels in many personal care products.

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

### Handling precautions

#### Storage

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

#### Health & Biosciences

Home & Personal Care

#### 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 LANXESS representative for more information

### Health and Safety Information:

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the LANXESS products mentioned in this publication. For materials mentioned which are not LANXESS products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be followed. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper use and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets, product information and product labels. Consult your LANXESS representative in Germany or contact the Regulatory Affairs and Product Safety Department of LANXESS Deutschland GmbH, or, for business in the USA, the LANXESS Corporation Product Safety and Regulatory Affairs Department in Pittsburgh, PA, USA.

## Regulatory Compliance Information:

Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, BfR, NSF, USDA, and CPSC. If you have any questions on the regulatory status of these products, for business in the USA, contact the LANXESS Corporation Regulatory Affairs and Product Safety Department in Pittsburgh, PA, USA or for business outside US the Regulatory Affairs and Product Safety Department of LANXESS Deutschland GmbH in Germany.

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