

## KORALONE™ C-204 Preservative for Household and Industrial & Institutional Products

### Description

For decades Rohm and Haas has driven the progress of isothiazolinone chemistry to meet your evolving needs.

Our goal - to provide our customers with much more than preservatives. Rohm and Haas is committed to both the isothiazolinone chemistry and the household industry. We have extensive toxicological and environmental databases and technical expertise that has allowed us to register isothiazolinone preservatives globally, including Japan. This knowledge has also helped us support the product with both the Dermatology community and Regulatory Authorities throughout the world. Now, we are applying our expertise to KORALONE C-204 preservative. KORALONE C-204 preservative is a highly effective antimicrobial agent recommended for use in preservation of household products.

The optimized ratio between methylchloroisothiazolinone/methylisothiazolinone chemistry (MCI/MI) and n-octylisothiazolinone (NOI) chemistry allows to use KORALONE C-204 at unusually low concentrations.

### Benefits of KORALONE C-204 Preservative

- Highly effective against bacteria, yeasts and moulds at low use levels.
- Excellent cost-efficacy.
- Formaldehyde and formaldehyde releasers free.
- Effective alternative to formaldehyde and formaldehyde donors.
- Readily incorporated in household product formulations.
- Compatible and effective with anionic, cationic, non ionic surfactants and commonly used household product ingredients.
- Stable over a wide range of pH (2 to 8- 8.5) and temperature conditions.
- Non toxic at use levels.
- Safe to use at recommended use levels.
- Environmentally acceptable: rapidly degrades, does not bioaccumulate and is non persistent in the environment.

### KORALONE C-204

#### Formulation and Properties

These properties are typical but do not constitute specifications.

#### Chemical Composition

<b>Total Active Ingredients</b>	<b>3.6%</b>
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5-chloro-2-methyl-4-isothiazolin-3-one (MCI)	
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2-methyl-4-isothiazolin-3-one (MI)	
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N-octyl-isothiazolin-3-one (NOI)	
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### Insert Ingredients

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Propylene glycol	32%
Water	balance
Proprietary stabilizer	

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### Physical Properties

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Appearance	Clear, pale yellow blue-green liquid
Flash Point	93°C
Freezing Point	minus 10°C
Solubility in water	>77% and <90%
pH	2 - 4
Stability	Stable at least one year at 25°C and 55°C temperatures

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### Suggested Applications

- **Laundry products**, such as:
  - liquid laundry detergents
  - fabric softeners
  - pre-spotters
- **Liquid detergents**, such as:
  - hand dishwashing detergents
  - hand cleaners
  - hand soaps
- **Cleaners and polishes**, such as:
  - all purpose cleaners
  - floor and furniture polishes/waxes
- **Raw materials and surfactants** used in the Household and Industrial & Institutional industry.

For regulatory information about KORALONE C-204 preservative, please ask your local Rohm and Haas contact or liaise with our Product Integrity Department.

### Recommended Use Levels

For effective preservation of domestic products it is recommended that KORALONE C-204 should be dosed in the range of 0.03% to 0.05% as supplied, which is equivalent to 9 ppm to 18 ppm total active ingredients.

**N.B.** To ensure long term protection of the product it is advisable to avoid use-levels below 0.025%. Since the components of household formulations could vary considerably and may have impact on the effect of preservatives, we advise each manufacturer to confirm the efficacy and stability of KORALONE C-204 in use.

### KORALONE C-204 Preservative Efficacy

KORALONE C-204 preservative exhibits outstanding antimicrobial activity against gram-positive and gram-negative bacteria, yeasts and molds. The following tables give the minimum level in ppm of KORALONE C-204 preservative, as supplied and as active ingredients that inhibited the growth of various microorganisms in test tube cultures. The data demonstrate the broad activity of KORALONE C-204 preservative, but must not be taken as recommended use concentrations.

### Minimum Inhibitory Concentration

Efficacy on Bacteria: M9G media pH 7.0		24 hours	
Bacteria Strains	ATCC	ppm a.i.	% product
<i>Alcaligenes faecalis</i>	8750	0.16	0.0004
<i>Burkholderia cepacia</i>	25416	0.82	0.0023
<i>Escherichia coli</i>	8739	0.82	0.0023
<i>Enterobacter cloacae</i>	13047	0.56	0.0016
<i>Enterobacter aerogenes</i>	15038	0.65	0.0018
<i>Enterobacter gergoviae</i>	33028	1.12	0.0031
<i>Klebsiella pneumoniae</i>	10031	0.65	0.002
<i>Pseudomonas aeruginosa</i>	9027	1.03	0.0029
<i>Pseudomonas fluorescens</i>	17397	0.56	0.0016
<i>Pseudomonas putida</i>	12633	4.42	0.012
<i>Proteus vulgaris</i>	13315	0.31	0.0009
<i>Bacillus subtilis</i>	6633	0.86	0.0024
<i>Staphylococcus aureus</i>	6538	0.65	0.002

### Minimum Inhibitory Concentration

Efficacy on Mould and Yeast: M9G media pH 5.5		5 days	
Mould/yeast strains	ATCC	ppm a.i.	% product
<i>Aspergillus niger</i>	16404	1.33	0.0037
<i>Penicillium ochrochloron</i>	9112	0.49	0.0014
<i>Penicillium oxalicum</i>	1126	0.43	0.0012
<i>Geotrichum candidum</i>	12784	0.31	0.0009
<i>Candida albicans</i>	10231	0.43	0.0012
<i>Rhodotorula rubra</i>	9449	0.42	0.0012

Bacteriostatic and fungistatic tests performed by serially diluting test compounds in Mineral salts media (M9G) + 1% yeast extract and 1:100 inoculation with 24-hour broth cultures of test bacterium or yeast, or a fungal spore suspension prepared from 7- to 14- day culture slants. Minimum inhibitory concentration levels determined visually after 1 day incubation at 30°C for bacteria and 5 days at 25 °C for fungi. ATCC: American type Culture Collection.

### Multiple Challenge Efficacy Test In a Dishwashing Liquid Formulation (pH 6.8)

The microbiological performance of KORALONE C-204 preservative in most products is excellent. Long-term microbiological protection is obtained employing use levels up to 18 ppm active ingredients (0.05% product, as supplied, by weight). Typical use levels for most household and industrial & institutional products are in the range of 9 ppm (0.025%) to 15 ppm (0.04%) active ingredient. For each formulation, it is important to ensure stability of the active ingredients and assess the efficacy through a microbiological challenge test. Evaluation in a Dishwashing liquid formulation (pH 6.8) indicates that even at 0.03%, KORALONE C-204 preserves adequately the formulation after 4 successive inoculations. More details of this procedure can be obtained from your nearest Rohm and Haas sales office.

### Colony Forming Unit per gram of product

KORALONE C-204 added in % product	1st inoculation		2nd inoculation		3rd inoculation		4th inoculation					
	TO		2 days		2 weeks		4 weeks		6 weeks		8 weeks	
	B	M/Y	B	M/Y	B	M/Y	B	M/Y	B	M/Y	B	M/Y
0	10 <sup>7</sup>	10 <sup>4</sup>	10 <sup>7</sup>	10 <sup>4</sup>	10 <sup>7</sup>	2.10 <sup>3</sup>	10 <sup>7</sup>	3.10 <sup>3</sup>	10 <sup>7</sup>	3.10 <sup>3</sup>	10 <sup>7</sup>	2.8.10 <sup>3</sup>
0.03%	10 <sup>7</sup>	10 <sup>4</sup>	10 <sup>5</sup>	<10	<10	<10	<10	<10	<10	<10	<10	<10
0.05%	10 <sup>7</sup>	10 <sup>4</sup>	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

B: bacteria M: Mould Y: yeast.

Inoculum strength B: 10<sup>8</sup> - 10<sup>9</sup> cfu/ml, M/Y: 10<sup>6</sup> - 10<sup>7</sup>

### KORALONE C-204 Chemical Stability Maximizing Stability

As with many chemicals, the stability of KORALONE C-204 preservative may be affected by various chemical or environmental conditions. It is recommended to avoid high temperatures (above 60°C) for extended periods of time.

KORALONE C-204 preservative is best added when the temperature is below 45°C. Some degradation of MCI active ingredient may occur above pH 8 - 8.5. The degree of degradation experienced is highly dependent on the formulation components. For high alkaline formulations NEOLONEM-10 bactericide is recommended.

### Safe Handling of KORALONE C-204

Use appropriate personal protective equipment. This will include a rubber apron or impervious jacket with apron, suitable impervious, full length neoprene or nitrile gloves and footwear. Protective chemical splash goggles should also be worn. Refer to the material safety data sheet for additional safety and handling information.

### Materials Compatibility

Materials compatible with KORALONE C-204:

- 316L Stainless Steel
- Reinforced vinyl ester (Derakane<sup>a</sup> 411-45)
- Fluoroelastomers (Viton<sup>b</sup>)
- Phosphenylene sulphide plastic (Ryton<sup>c</sup>)
- Low density polyethylene
- Teflon<sup>d</sup>
- Nordel<sup>b</sup>

<sup>a</sup> Derakane is a trademark of Dow Chemical;

<sup>b</sup> Viton and Nordel are trademarks of DuPont Dow Elastomers;

<sup>c</sup> Ryton is a trademark of ChevronPhillips;

<sup>d</sup> Teflon is a trademark of DuPont Company.

### Material Safety Data Sheets

Rohm and Haas Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Under the principles of Product Stewardship and some government regulations (for example, the US OSHA Hazard Communication Standard), workers must have access to and understand MSDS all hazardous substances to which they are exposed.

Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS any hazardous products in the workplace.

Upon initial shipment of all products (including samples), Rohm and Haas Company sends the appropriate MSDS to the recipient. If you do not have access to one of these MSDS, please contact your local Rohm and Haas representative for a copy. Updated MSDS are sent upon revision to all customers of record.

Rohm and Haas Company is a member of the American Chemistry Council (ACC) and is committed to the ACC's Responsible Care Program.

Use biocides safely. Always read the label and product information before use.

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