ANTIMICROBIAL AGENTS

SECTION
I-12 REVISED
DOWICIL 75
Preservative

DOWICIL* 75 Preservative

General

DOWICIL 75 Preservative is Dow's designation for 1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride to which a stabilizer (sodium bicarbonate) has been added.

The adhesives industry can utilize this preservative to protect its products against deterioration and spoilage during manufacture, storage, and service. Metalworkers can incorporate DOWICIL 75 into metal-cutting fluids to eliminate odor, rancidity, and acidity, and to improve stability. DOWICIL 75 is used to preserve water-based latex paints in the can while having no effect on the viscosity, stability, and other physical properties of the formulation or on the color-fastness of the paint film. It can be used by manufacturers of pulp and paper to preserve water-based coating formulations. Textile producers can use it to preserve spinning emulsions and finishing solutions.

DOWICIL 75 also may be utilized in preserving raw latex emulsions, joint-cement products, biodegradable detergents, floor-wax emulsions and floor polishes, inks, laundry starches, and polyvinyl alcohol.

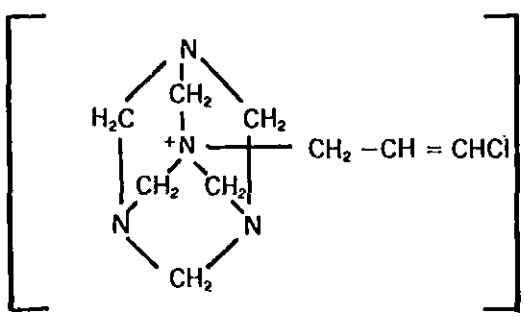
NOTE: *DOWICIL 75 Preservative is incompatible with casein in both liquid and dry systems. Reports also indicate DOWICIL 75 to be incompatible with some types of amine-modified clays.*

In the area of end-product quality control, the effect of introducing a contaminant (microbial or chemical in nature) into the finished product is always of concern. The manufacture of products containing cellulosic thickeners offers an opportunity for enzymes to be added inadvertently to products such as latex paints. These enzymes can cause a loss of viscosity to such a degree as to destroy the product by hydrolyzing the cellulosic thickener. DOWICIL 75 Preservative has been proven to be very effective in the control of bacteria and fungi. These microorganisms, left unchecked, can cause stored emulsions to lose viscosity. On the other hand, these preservatives are not expected to act as inhibitors against the intact enzymes that could be introduced into the formula from raw materials or from inadequate housekeeping practices.

Physical Properties

(Laboratory results typical of the product, but not to be confused with or regarded as specifications.)

Structure



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DOW
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DESIGNED PRODUCTS DEPARTMENT

Form No. 192-479-76

I-12
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Physical Properties — continued

Formula	$C_6H_{12}N_4(CH_2CHCHCl)Cl$
Molecular Weight	251.2
Bulk Density	43 lb/ft³
Specific Gravity	1.54 g/cc
Bulking Value	0.0779 gal/lb

The active ingredient, 1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride, exhibits the following solubilities (approx. g/100 g at 25°C):

Acetone	0.05
DOWANOL* DPM Glycol Ether	0.17
DOWANOL PM Glycol Ether	1.36
Ethanol, Absolute	4.49
Glycerine (99.5%)	2.17
Hexane	<0.01
Isopropanol, Anhydrous	39.5
Propylene Glycol, U.S.P.	20.6
Water	222.0

The inert ingredient, sodium bicarbonate, is insoluble in all of the above solvents with the exception of water. DOWICIL 75 Preservative is soluble in water to the extent that 20% (by weight) solutions can easily be prepared. The difference in the relative solubility of the active ingredient and the sodium bicarbonate can be used by the formulator to separate the two components. For example, a formulator can add only the active ingredient to his product by putting DOWICIL 75 into isopropanol and removing the bicarbonate by simple filtration or decantation.

Concentrated and diluted water solutions of DOWICIL 75 have good pH stability, the initial pH of such solutions being approx 7.5. Solutions in the range of 1-20% will drift slightly alkaline and stabilize at a pH of about 8.5. It should also be noted that a 20% solution of DOWICIL 75 has been stored for 2 weeks without losing its preservative properties. Therefore, it is suggested that concentrated solutions of DOWICIL 75 can be used as long as the slight color developed in the solution is not detrimental to the substrate to which it is added.

Preparation and storage of solutions of DOWICIL 75 are best done in vented vessels. Special precautions must be taken if an air-tight container is used since a concentrated solution can develop pressure in a closed system, especially if it becomes contaminated with an acid (causing the release of carbon dioxide).

* Trademark of The Dow Chemical Company

Sales Specifications (Method of Analysis 24695b)

Description	Off-white powder
Active ingredient [1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride]	67.5%
Inert ingredients	32.5%
Sodium Bicarbonate	25 ± 2%
Others, max	9.5
Color, Gardner, max	4
Sieve Analysis, Through #5 U.S. Standard Sieve	100%

Methods of analyses for these items may be obtained from Dow Chemical U S.A., Designed Products Department, 2040 Dow Center, Midland, Michigan 48640.

E.P.A. Registration No. 464-403.

Meets the requirements of Food Additive Regulation CFR 121.2520 for use as a preservative in adhesives, CFR 121.2522 for preservation of polyurethane resins in contact with dry bulk foods, and CFR 121.2526 for use only as a preservative at a level of 0.3 weight percent in latexes used as pigment binders in paper and paperboard intended for use in contact with dry and fatty foods.

Notice to Formulators

Any substance or mixture of substances (pesticide) formulated with this product must be tested for efficacy and safety in accordance with the registration requirements of the Environmental Protection Agency. The registration of the technical chemical identified herein does not cover the registration of pesticides formulated therewith.

Packages

DOWICIL 75 Preservative is sold in fiber drums having a net weight of 100 lb.

Antifungal and Antibacterial Efficacies†

Test Organism	PPM for Inhibition	PPM[1] for Kill
Bacteria		
Staphylococcus aureus	10-50	50-100
Salmonella choleraesuis	10-50	50-100
Pseudomonas aeruginosa PRD-10	50-100	50-100
Klebsiella pneumoniae	10-50	100-500
Proteus vulgaris	10-50	10-50
Q-1 Isolate[2]	10-50	50-100
Fungi		
Aspergillus niger	>1000	
Rhizopus nigricans	500-1000	

† These data provide general information on the broad spectrum of DOWICIL 75 in aqueous solution. They were developed by an agar plate technique. Subculture techniques were employed, but no neutralizer was used. The information provided is in no way to be construed as recommended concentrations effective in actual use situations. The "kill" concentrations are not intended to represent or imply that the material to be preserved is actually "disinfected" or "sterile." Refer to specific applications for suggested use concentrations.

[1] Parts per million.

[2] Q-1 is a bacterial isolate taken from a commercially produced acrylic latex.

Applications

Product or Industry	Reason for Treatment	Suggested Concentration[1]	How to Apply
Adhesive	To protect formulations against deterioration during manufacture, storage and service.	0.07-0.66% by wt of formulation.	Add as concentrated aqueous solution.
Construction	To increase shelf and use life of caulking, grouting, spackling compounds and joint cements.	0.07-0.3% by wt of formulation.	Varies depending upon formulation.
Detergents	To increase shelf life.	0.04-0.13% by wt of formulation.	Add as aqueous solution.

[1] Refers to concentrations of DOWICIL 75 Preservative.

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Applications

Product or Industry	Reason for Treatment	Suggested Concentration[1]	How to Apply
Water-Based Floor Waxes and Polishes	To increase shelf life.	0.07-0.2% by wt of formulation.	Add as aqueous solution.
Water-Based Inks	To increase shelf life of fountain pen, fabric and paper-printing ink.	0.20-0.27% by wt of ink.	Add as aqueous solution.
Latex Emulsions	To prevent bacterial deterioration during manufacture, transit and storage of raw emulsions.	0.05-0.3% by wt of total emulsion.	Add as aqueous solution.
Laundry Starch	To increase shelf and use life of liquid formulations.	0.07-0.2% by wt of formulation.	Add as aqueous solution.
Metal-working	To preserve metal-working fluids formulated by metal workers.	0.015% min by wt of formulation.[2]	Add to water phase of fluid during formulation.
Paint	To increase shelf life of cellulose-thickened latex paints.	0.01-0.2% by wt of formulation.	Add dry or as aqueous solution.
Pulp and Paper	To preserve coatings, finishes and printing colors based on starch and latex.	0.13-0.27% by wt of formulation.	Add as aqueous solution.
Textiles	To preserve spinning emulsions for rayon, finishing solutions and printing pastes.	0.13-0.27% by wt of formulation.	Add as aqueous solution.

[1] Refers to concentrations of DOWICIL 75 Preservative.

[2] In cases of severe microbial contamination, higher concentrations of DOWICIL 75 may be required. Concentrations of 0.1-0.25% DOWICIL 75 by wt are suggested for control of bacteria and fungi in recirculating metal-working lubricant systems.

Hazards Due to Toxicity and Precautions for Safe Handling and Use

The following statements on health hazards summarize our laboratory and application data. The precautions for safe handling and use are necessarily general in nature, since the circumstances associated with each customer's use of the material are unknown and beyond our control. Suggestions with regard to any hazards likely to be encountered in specific operations will be made upon request whenever possible. Inquiries about specific operations and uses should be addressed to Dow Chemical U.S.A. Assistance in evaluating particular plant conditions may be obtained from certain consulting laboratories and from state Departments of Health or of Labor, many of which have an Industrial Hygiene Service.

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5 Handling Precautions for Cleaning Up Spills or When Gross Contact is Likely

Eyes – Avoid eye contact.
Skin – Avoid skin contact.

First Aid Measures

Eye Contact – Contaminated eyes should be flushed with plenty of water. Medical attention should be obtained if irritation develops.

Skin Contact – Contaminated skin should be flushed with plenty of water. Medical attention should be obtained if irritation develops.

Health Hazards

Direct contact of DOWICIL 75 Preservative with the eyes may cause some slight irritation which would be expected to clear up in several days.

Precautions for Safe Handling

Safety glasses or their equivalent should be worn when this preservative or its solutions are handled. Contaminated clothing and shoes should not be reused until they have been cleaned.

DOWICIL 75 Preservative — Toxicological Data

Test	Animal	Results
Acute Oral	Rat	LD_{50}-1190 mg/kg body wt
Chronic Oral	Rat	Dietary levels up to 15 mg active ingredient/kg body wt per day for 90 days produced no evidence of significant toxicological effect.
Eye Irritation	Rabbit	The concentrated material caused injection of some blood vessels of the conjunctiva and some chemosis but not enough to produce eversion of the eyelids. Slight necrosis of the cornea was discernible on staining with fluorescein dye in one animal out of six at 72 hours post-instillation of the material.
Skin Irritation	Rabbit	The dry powder produced no discernible [illegible] skin and no more than slight skin [illegible] after 24 hours of contact.
Skin Absorption	Rabbit	One out of four rabbits on a skin absorption test using the conventional cuff technique expired on the 4th day after a 24-hr exposure to 2,000 mg DOWICIL 75 per kg. The remaining animals showed no indications of toxicity. No gross pathological changes were detected at necropsy.
Inhalation	Rat	Exposure to concentrations of 9.33 mg dust/liter of air for 1 hour caused no observable adverse effects during or after the exposure. Gross pathological examination of the animals 14 days after exposure revealed no compound-related changes.

Safe Storage of DOWICIL 75 Preservative

DOWICIL 75 must be stored in a cool, dry place below 140°F (60°C). Excess heat may cause thermal decomposition which will release smoke and flammable vapors.

If the entire contents of a drum are not used upon opening, reseal the polyethylene liner to keep moisture from caking the product. Water solutions of DOWICIL 75 should be kept below 77°F (25°C).

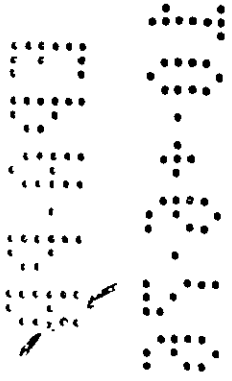
As previously noted, the preparation and storage of DOWICIL 75 solutions is best done in vented vessels. Special precautions must be taken if an air-tight container is used. A concentrated solution can develop pressure in a closed system should it become contaminated with an acid, causing the release of carbon dioxide.

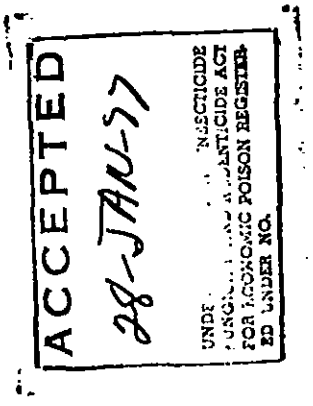
Further Information

If more specific information, or information on toxicity of antimicrobials in a specific application is needed, contact Dow Chemical U.S.A., Designed Products Department, 2040 Dow Center, Midland, Michigan 48640

Customer Notice

Dow encourages its customers to review their applications of Dow products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel are willing to assist customers in dealing with ecological and product safety considerations. Your Dow salesman can arrange the proper contacts.





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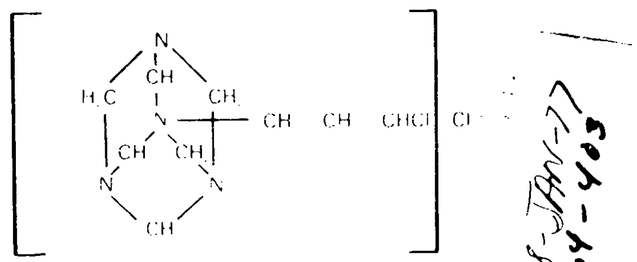
Physical Properties

(Laboratory results typical of the product, but not to be confused with or regarded as specifications.)

Structure



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Physical Properties — continued

Formula	$C_6H_{12}N_4(CH_2CHCHCl)Cl$
Molecular Weight	251.2
Bulk Density	43 lb/ft³
Specific Gravity	1.54 g/cc
Bulking Value	0.0779 gal/lb

The active ingredient, 1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride, exhibits the following solubilities (approx. g/100 g at 25 C):

Acetone	0.05
DOWANOL® DPM Glycol Ether	0.17
DOWANOL PM Glycol Ether	1.36
Ethanol, Absolute	4.49
Glycerine (99.5%)	2.17
Hexane	0.01
Isopropanol, Anhydrous	39.5
Propylene Glycol, U.S.P.	20.6
Water	222.0

The inert ingredient, sodium bicarbonate, is insoluble in all of the above solvents with the exception of water. DOWICIL 75 Preservative is soluble in water to the extent that 20% (by weight) solutions can easily be prepared. The difference in the relative solubility of the active ingredient and the sodium bicarbonate can be used by the formulator to separate the two components. For example, a formulator can add only the active ingredient to his product by putting DOWICIL 75 into isopropanol and removing the bicarbonate by simple filtration or decantation.

Concentrated and diluted water solutions of DOWICIL 75 have good pH stability, the initial pH of such solutions being approx 7.5. Solutions in the range of 1-20% will drift slightly alkaline and stabilize at a pH of about 8.5. It should also be noted that a 20% solution of DOWICIL 75 has been stored for 2 weeks without losing its preservative properties. Therefore, it is suggested that concentrated solutions of DOWICIL 75 can be used as long as the slight color developed in the solution is not detrimental to the substrate to which it is added.

Preparation and storage of solutions of DOWICIL 75 are best done in vented vessels. Special precautions must be taken if an air tight container is used since a concentrated solution can develop pressure in a closed system, especially if it becomes contaminated with an acid (causing the release of carbon dioxide).

Sales Specifications (Method of Analysis 24695b)

Description	Off white powder
Active ingredient, 1-(3-chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride	67.5%
Inert ingredients	32.5%
Sodium Bicarbonate	25.2%
Others, max	9.5
Color, Gardner, max	4
Sieve Analysis, Through #5 U.S. Standard Sieve	100%

Methods of analyses for these items may be obtained from Dow Chemical U.S.A., Designed Products Department, 2040 Dow Center, Midland, Michigan 48640.

E.P.A. Registration No. 464-403.

Meets the requirements of Food Additive Regulation CFR 121.2520 for use as a preservative in adhesives, CFR 121.2522 for preservation of polyurethane resins in contact with dry bulk foods, and CFR 121.2526 for use only as a preservative at a level of 0.3 weight percent in latexes used as pigment binders in paper and paperboard intended for use in contact with dry and fatty foods.

Notice to Formulators

Any substance or mixture of substances (pesticide) formulated with this product must be tested for efficacy and safety in accordance with the registration requirements of the Environmental Protection Agency. The registration of the technical chemical identified herein does not cover the registration of pesticides formulated therewith.

Packages

DOWICIL 75 Preservative is sold in fiber drums having a net weight of 100 lb.

Antifungal and Antibacterial Efficacies*

Test Organism	PPM for Inhibition	PPM[1] for Kill
Bacteria		
Staphylococcus aureus	10-50	50-100
Salmonella choleraesuis	10-50	50-100
Pseudomonas aeruginosa PRD-10	50-100	50-100
Klebsiella pneumoniae	10-50	100-500
Proteus vulgaris	10-50	10-50
Q-1 Isolate[2]	10-50	50-100
Fungi		
Aspergillus niger	1000	
Rhizopus nigricans	500-1000	

These data provide general information on the broad spectrum of DOWICIL 75 Preservative. They were developed by an agar plate technique. Substrate fermentations were employed before the data used. The materials were known to be prepared as recommended concentrations for actual use situations. The data presented are not to be construed to represent or imply that the material to be preserved satisfactorily is identical or similar to the substrates listed or that the concentrations listed are recommended for suggested use concentrations.

[1] Parts per million.

[2] Isolated from spoiled latex paint. Identified as a pseudomonad by Dow Microbiology Laboratory.

Applications

Product or Industry	Reason for Treatment	Suggested Concentration[1]	How to Apply
Adhesive	To protect formulations against deterioration during manufacture, storage and service.	0.07-0.66% by wt of formulation	Add as concentrated aqueous solution.
Construction	To increase shelf and use life of caulking, grouting, spackling compounds and joint cements	0.07-0.3% by wt of formulation.	Varies depending upon formulation
Detergents	To increase shelf life.	0.04-0.13% by wt of formulation	Add as aqueous solution

[1] Refers to concentrations of DOWICIL 75 Preservative.

Continued

Notice to Formulators

Any substance or mixture of substances (pesticide) formulated with this product must be tested for efficacy and safety in accordance with the registration requirements of the Environmental Protection Agency. The registration of the technical chemical identified herein does not cover the registration of pesticides formulated therewith.

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Test Organism	PPM for Inhibition	PPM[1] for Kill
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Staphylococcus aureus	10-50	50-100
Salmonella choleraesuis	10-50	50-100
Pseudomonas aeruginosa PRD-10	50-100	50-100
Klebsiella pneumoniae	10-50	100-500
Proteus vulgaris	10-50	10-50
Q-1 Isolate[2]	10-50	50-100
Fungi		
Aspergillus niger	1000	
Rhizopus nigricans	500-1000	

These data provide general information on the broad spectrum of DOWICIL 75 in aqueous solution. They were developed by an agar plate technique. Subculture techniques were employed, but no neutralizer was used. The information provided is in no way to be construed as recommended concentrations effective in actual use situations. The "kill" concentrations are not intended to represent or imply that the material to be preserved is actually "disinfected" or "sterile." Refer to specific applications for suggested use concentrations.

† Parts per million

‡ Q-1 is a bacterial isolate taken from a commercially produced acrylic latex

Applications

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Adhesive	To protect formulations against deterioration during manufacture, storage and service.	0.07-0.66% by wt of formulation.	Add as concentrated aqueous solution.
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[1] Refers to concentrations of DOWICIL 75 Preservative

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Applications

Product or Industry	Reason for Treatment	Suggested Concentration[1]	How to Apply
Water-Based Floor Waxes and Polishes	To increase shelf life.	0.07-0.2% by wt of formulation.	Add as aqueous solution.
Water-Based Inks	To increase shelf life of fountain pen, fabric and paper-printing ink.	0.20-0.27% by wt of ink.	Add as aqueous solution.
Latex Emulsions	To prevent bacterial deterioration during manufacture, transit and storage of raw emulsions.	0.05-0.3% by wt of total emulsion.	Add as aqueous solution.
Laundry Starch	To increase shelf and use life of liquid formulations.	0.07-0.2% by wt of formulation.	Add as aqueous solution.
Metal-working	To preserve metal-working fluids formulated by metal workers.	0.015% min by wt of formulation.[2]	Add to water phase of fluid during formulation.
Paint	To increase shelf life of cellulose-thickened latex paints.	0.01-0.2% by wt of formulation.	Add dry or as aqueous solution.
Pulp and Paper	To preserve coatings, finishes and printing colors based on starch and latex.	0.13-0.27% by wt of formulation.	Add as aqueous solution.
Textiles	To preserve spinning emulsions for rayon, finishing solutions and printing pastes.	0.13-0.27% by wt of formulation.	Add as aqueous solution.

[1] Refers to concentrations of DOWICIL 75 Preservative

[2] In cases of severe microbial contamination, higher concentrations of DOWICIL 75 may be required. Concentrations of 0.1-0.25% DOWICIL 75 by wt are suggested for control of bacteria and fungi in recirculating metal-working lubricant systems.

Hazards Due to Toxicity and Precautions for Safe Handling and Use

The following statements on health hazards summarize our laboratory and application data. The precautions for safe handling and use are necessarily general in nature, since the circumstances associated with each customer's use of the material are unknown and beyond our control. Suggestions with regard to any hazards likely to be encountered in specific operations will be made upon request whenever possible. Inquiries about specific operations and uses should be addressed to Dow Chemical U.S.A. Assistance in evaluating particular plant conditions may be obtained from certain consulting laboratories and from state Departments of Health or of Labor, many of which have an Industrial Hygiene Service.

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