

Net Weight:

# AMICAL™-77

## ANTIMICROBIAL AGENT

No. 5112

**WARNING:** Observe normal safety precautions when handling AMICAL™-77. Avoid breathing dust. Wash thoroughly after handling. Harmful or fatal if swallowed. In case of ingestion, call physician.

Causes eye irritation. Do not get into eyes. In case of eye contact, flush with water and call physician.

TM—Trademark

01-5220-F3

Active Ingredient:	Percent
para-chlorophenyl diiodomethyl sulfone	95
Inert Ingredients:	5
Total	100

AMICAL™-77 is recommended as an exterior latex paint preservative providing a broad spectrum of anti-bacterial and anti-fungal activity. See technical bulletin for details and directions for use.

See both side panels for warning and caution.



Chemical Division  
Abbott Laboratories  
North Chicago, Ill. 60064,  
U.S.A.

### ENVIRONMENTAL CAUTION:

Toxic to fish—Do not contaminate any body of water by cleaning of equipment or disposal of waste.

Do not reuse empty container. Destroy it by burying with waste or burning. Stay away from smoke or fumes.

EPA Reg. No. 275-22

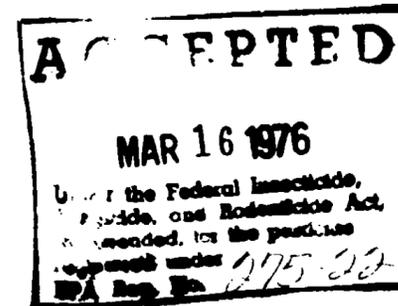
EPA Est. 275-IL-1

Lot No.

ACCEPTED WITH COMMENT

BULLETIN NO. 75-2

# TECHNICAL INFORMATION



AMICAL<sup>®</sup> 77

(EPA Reg. No. 275-22)

PRESERVATIVE FOR LATEX PAINTS

## ABBOTT LABORATORIES

## AMICAL® 77

## PRESERVATIVE FOR LATEX PAINTS

## NEW ORGANIC CHEMICAL ANTIMICROBIAL AGENT

Amical 77 is one of a series of new organic chemical antimicrobial agents. It provides mildewcide activity superior to that of organomercurials, and also provides package preservative action when used at higher mildewcide levels. Comparative laboratory and field exposure testing beginning in 1967 show the following advantages for Amical 77 preservative.

**AMICAL 77 PROTECTS LATEX PAINTS AGAINST MILDEW BETTER THAN ANY MERCURIALS TESTED.**

Outdoor exposure studies, including a two-year exposure study in southern Florida, indicate that Amical 77 is superior to standard mercurials for mildew inhibition. Refer to the results for Test Program A, page 6.

**AMICAL 77 MILDEW PROTECTION IS COMPARABLE OR SUPERIOR TO THAT OF COMPETITIVE ORGANIC CHEMICAL MILDEWCIDES.**

Recent outdoor exposure studies in severe mildew climates demonstrate equal or superior effectiveness for Amical 77 at use levels as low as two pounds per 100 gallons of paint, with the concurrent use of zinc oxide. Amical 77 was compared to competitive mildewcides at the same or lower cost/use levels. Refer to the results for Test Program B, page 8.

**AMICAL 77 ALSO ACTS AS A PACKAGE PRESERVATIVE.**

Amical 77 provides latex paints with in-can preservative action when used at a level of 0.5% (about 6 pounds per 100 gallons of paint). Tests indicate that a separate preservative is not necessary when Amical 77 is used at high mildewcide levels. Refer to the Recommendations on page 2 and the in-can stability study reported on page 10 for additional information.

**AMICAL 77 IS EFFECTIVE WITH OR WITHOUT ZINC OXIDE.**

Amical 77 does not require zinc oxide to be effective. However, Amical 77 is compatible with zinc oxide. Data show that if you use zinc oxide, lower levels of Amical 77 will be effective.

- AMICAL 77 DOES NOT ADVERSELY AFFECT PAINT FILM OR PACKAGE STABILITY.

Exposure tests show effects on chalking, color retention, cracking or flaking to be equal to those of standard mercurials, and in some cases Amical 77 has less of an effect. Laboratory tests show no changes in pH or viscosity, and no flocculation or foreign odors after 18 months storage in the can. Refer to Table 5, page 8.

- AMICAL 77 DOES NOT REQUIRE UNUSUAL HANDLING PRECAUTIONS.

Amical 77 is not considered to be a hazardous material to ship or store, nor is the product corrosive to the skin or eyes. Only the standard precautions for handling fine powders are required.

## RECOMMENDATIONS

### AMICAL 77 AS A MILDEWICIDE

Use levels are dependent upon the type and formulation of the latex paint system to be protected, and upon the expected severity of field conditions. Thus, thorough laboratory tests and field exposures are recommended to determine the optimum Amical 77 use level for a particular formulation. Suggested use levels for several common latex paint systems are presented in Table 1.

Field data show that when zinc oxide is used in the formulation, lower levels of Amical 77 will be needed. Please refer to Table 6, page 9, for specific test results.

TABLE 1/MILDEWICIDE USE LEVELS IN LATEX PAINTS

	Amical 77 Use Levels (Pounds per 100 Gallons Paint)					
	Straight Acrylic		20% Alkyd Modified Acrylic		Vinyl Acrylic	
	No ZnO	50 lb ZnO	No ZnO	50 lb ZnO	No ZnO	50 lb ZnO
Severe Humidity	4-6	2-4	4-6	2-4	4-6	2-4

### AMICAL 77 AS AN IN-CAN PRESERVATIVE

When used at a level of 0.5% (6 pounds per 100 gallons) in latex paints, Amical 77 provides in-can preservation in addition to mildewcide activity. Supporting data are presented on page 10.

Additional data about the role of Amical 77 as an in-can preservative has been published by the Kansas City Society for Paint Technology in "Nonmercurial Preservatives, Their Effectiveness and Relationship to Raw Materials in Latex Paints." JOURNAL OF PAINT TECHNOLOGY, Vol. 46; No. 589; pages 37-45.

In the Kansas City Study, Amical 77 is reported to have demonstrated in-can preservative activity at a level of 1.0 pounds per 100 gallons of paint.

#### WHERE TO ADD AMICAL 77 TO YOUR PAINT SYSTEM

Amical 77 is a micronized powder and can be dispersed easily in the pigment grind, preferably as the last material added to the dispersion. The following is a suggested procedure:

- Add the water, glycols, wetting agents and pigments to the mixing tank.
- Disperse until the desired grind is achieved.
- Add the Amical 77 and disperse five more minutes.
- Avoid heat build up and prolonged mixing.

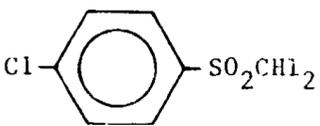
#### PHYSICAL AND MICROBIOLOGICAL PROPERTIES OF AMICAL 77

##### PHYSICAL PROPERTIES

Amical 77 is one of a series of newly developed organic chemicals offered exclusively by Abbott Laboratories. Chemically, Amical 77 is p-chlorophenyl diiodomethyl sulfone. Its structural formula and physical properties are summarized in Table 2.

Amical 77 is stable through a pH range of 4.0 to 10.5. In a laboratory evaluation, Amical 77 was heated in water buffered to pH 9.2 at 50°C for 8 days. No adverse effects were noted. Thus, the high pH values of acrylic paints present no stability problems.

TABLE 2/PHYSICAL PROPERTIES OF AMICAL 77

Amical 77			
Appearance	Fine Tan Powder		
Melting Point	134-138°C		
Specific Gravity	2.32 g/cc		
Bulking Value	5.17 gal/100 lb		
Assay	min 95%		
Minimum Solubility at 25°C (mg/ml)			
Water	0.2	Toluene	95
Ethyl alcohol	40	Dimethyl formamide	300
Isopropyl alcohol	20	Diethyl phthalate	96
Ethylene glycol	20	Diisooctyl phthalate	84
Acetone	350	Dibutyl phthalate	176
Hexane	1	Cellosolve acetate	509
Heptane	1	Carbitol acetate	211
Mineral Spirits	2	Methyl cellosolve	625
Benzene	150	Tributyl phosphate	286
Xylene	57	n-Propyl acetate	270

## MICROBIOLOGICAL PROPERTIES

Amical 77 provides a broad spectrum of antimicrobial activity. Amical 77 is especially effective against major paint mildew-causing organisms. Minimum inhibitory concentrations (MIC) against a series of organisms, including those of concern in in-can spoilage and coatings defacement, are presented in Table 3.

TABLE 3/MINIMUM INHIBITORY CONCENTRATION (MIC, PPM)

Organism	Amical 77
<u>Bacteria</u>	
Staphylococcus aureus	10
Pseudomonas aeruginosa	1000
Proteus vulgaris	100
Proteus mirabilis	100
Escherichia coli	100
Xanthomonas pruni	10
Erwinia amylovora	100
Pseudomonas syringae	100
Erwinia cartovora	100
Agrobacterium tumefaciens	100
Pseudomonas phaseolicola	100
Salmonella typhimurium	100
Streptococcus faecalis	100
Enterobacter aerogenes	1000
Salmonella choleraesuis	100
Bacillus subtilis	10

TABLE 3/CONTINUED

Organism	Amical 77
<u>Fungi</u>	
Chaetomium globosum	0.2
Myrothecium verrucaria	0.8
Aspergillus versicolor	0.8
Penicillium citrinum	0.8
Fusarium oxysporum	3.1
Alternaria species	0.4
Rhizopus nigricans	100
Alternaria solani	1
Ceratocytis ulmi	1
Microsporum gypseum	1
Aspergillus oryzae*	0.8
Aspergillus niger*	0.4
Aureobasidium pullulans* (Pullularia pullulans)	0.4

\*Of major interest in paint mildew

### SAFETY AND HANDLING

NORMAL BULK CHEMICAL HANDLING PRECAUTIONS ARE ADEQUATE.

Amical 77 is not dangerous to handle, and requires no unusual handling precautions.

Amical 77 is a very fine powder. Though it is not irritating to the skin, Amical 77 can cause slight, temporary irritation of the eyes.

Though Amical 77 is not considered a toxic substance when inhaled, care should be taken to avoid breathing the dust. For further information, please refer to Table 4 and its footnotes. It is good practice for workers to take the standard precautions of wearing gloves, protective glasses and dust masks when handling Amical preservatives.

TABLE 4/AMICAL 77 TOXICOLOGICAL PROPERTIES

Amical 77 Study	Results
Oral LD <sub>50</sub> Mice	3,600 mg/kg
Rats	600 mg/kg
Dermal Irritation; rabbits, normal and abraded skin	None
Eye Irritation, Draize Test (1)	Slight
Inhalation Toxicity (2)	Not Toxic
TL <sub>50</sub> Rainbow trout	0.14 ppm
Bluegills	0.24 ppm

Notes (1) The pure chemical put directly into the eye cause no corneal damage but can cause slight, temporary irritation. See first aid suggestions below. (2) Amical 77 is not considered a toxic substance when inhaled as defined under 40 CFR 162.8 (3) Amical 77 is toxic to fish. Care should be taken not to contaminate any body of water with Amical 77 by cleaning equipment or disposing of wastes.

## FIRST AID

If Amical 77 gets on the skin, wash area immediately with soap and water.  
If Amical 77 gets in the eye, flush immediately with copious amounts of water and call a physician. In case Amical 77 is ingested, induce vomiting at once and call a physician.

## AMICAL TEST PROGRAMS

Discussion of two outdoor exposure studies to determine mildewcide activity follows. Also included is a discussion of a study of Amical 77 as an in-can preservative.

Abbott has underway a continuing program of outdoor exposure studies at three test locations, and results will be published periodically in the format of supplementary research reports.

## AMICAL 77 MILDEWCIDE ACTIVITY

Test A	Two-year exposure/southern Florida/1969
Test B	Twelve month exposure/southern Florida/1973

## RESULTS OF THE TEST PROGRAM

Amical 77 was found to be a very suitable replacement as a mildewcide for organomercurial products in protective coatings.

Amical 77 provided protection equal to or greater than competitive organic chemical mildewcides at approximately equal-cost ratios.

### TEST A TWO-YEAR EXPOSURE/SOUTHERN FLORIDA/1969

#### Test A Conclusions

- Two years of outdoor exposure demonstrate that Amical 77 is generally superior to phenyl mercuric acetate as a mildewcide in latex paints.
- As a mildewcide, Amical 77 is effective at lower concentrations than phenyl mercuric acetate.
- Amical 77 functions as a package preservative when used at a mildewcide level of 0.5% (about 6 pounds per 100 gallons of paint). Data are presented in Table 7 on page 10.
- Amical 77 has no adverse effect on coatings durability. It does not increase chalking, cracking or flaking.

## COMPARE AMICAL 77 WITH STANDARD MERCURIALS.

To provide an indication of the effectiveness of Amical 77 mildewcide, an extensive exposure testing program was instituted in southern Florida in June, 1969, and continued for twenty-four months.

Since it is considered to be an industry standard, phenyl mercuric acetate was included in the study to provide a basis for comparison. A second mercurial compound, phenyl mercuric propionate, was also tested on a selective basis, but was not included in all trials because of its similarity to phenyl mercuric acetate.

## FORMULATIONS EVALUATED

Antimicrobial agents: Amical 77 was evaluated along with phenyl mercuric acetate (PMA) and phenyl mercuric propionate (PMP). Amical 77 was examined at concentrations of 0.50, 0.75 and 1.0%, based on total weight of the paint and approximating 6, 9 and 12 pounds of mildewcide per 100 gallons, respectively. The phenyl mercuric acetate used was PMA 30, and was tested at a recommended concentration of 1.0%.

Paint vehicles: The antimicrobial agents were dispersed in the following typical exterior latex paints by adding them to the pigment grind prior to let down. The formulations of these paints were standard formulas recommended by latex suppliers and are available on request.

- 1-4. Acrylic latex house paint: white, pastel yellow, pastel blue and pastel pink.
5. Alkyd modified acrylic latex house paint: white.
6. Ethylene vinyl acetate house paint: white.

## EXPOSURE TESTING

Application methods: Two coats of each paint were brush applied on yellow pine at a spreading rate of 325 square feet per gallon with 24 hours of drying between coats. After drying for at least one week, the panels were then exposed in southern Florida for a period of two years beginning in June, 1969.

Southern yellow pine was chosen in an effort to exaggerate conditions and thus determine the effect of Amical 77 on paint durability as well. Yellow pine characteristically contains a higher degree of nutrients that support fungus growth. Additionally, yellow pine is a common construction material in the South where mildew is a more serious problem. During the exposure test, the panels were examined for mildew formation, dirt pickup, color change, chalking, cracking and flaking. The results at the end of the two-year exposure are summarized in Table 5.

Rating Scheme: To more readily analyze the results, a simple rating scheme is used in the following tables. Since it is considered to be an industry standard, one percent phenyl mercuric acetate has been used as the control.

++	=	Decidedly superior to PMA
+	=	Somewhat superior to PMA
Blank	=	Essentially equal to PMA
-	=	Somewhat inferior to PMA
--	=	Decidedly inferior to PMA

TABLE 5/AMICAL 77 TWO YEAR EXPOSURE TESTING (SOUTHERN FLORIDA, 1969)

Agent	Concentration (%)	Mildew	Dirt Pickup	Chalking	Color Change	Cracking	Flaking
<u>ACRYLIC LATEX HOUSE PAINT</u>							
<u>AMICAL 77</u>							
White	0.5	++				+	+
	0.75	++				+	+
	1.0	++			-	+	
Yellow	1.0			+		+	
Blue	1.0				-		
Pink	1.0						+
<u>ALKYD MODIFIED LATEX HOUSE PAINT</u>							
<u>AMICAL 77</u>							
White	1.0	++		+		+	++
<u>ETHYLENE VINYL ACETATE HOUSE PAINT</u>							
<u>AMICAL 77</u>							
White	0.75				+	+	+

TEST B TWELVE MONTH EXPOSURE/SOUTHERN FLORIDA/1973

Test B Conclusions

- Amical 77 is effective in latex paints with or without zinc oxide.
- Lower levels of Amical 77 can be used if zinc oxide is included in the formulation. With 50 pounds of zinc oxide, Amical 77 was effective at a level of 2 pounds per 100 gallons. Control panels with zinc oxide alone were failing.
- Performance of Amical 77 equals that of nonmercurial "M" and non-mercurial "N" on a competitive or reduced cost/use basis.

## FORMULATIONS EVALUATED

Antimicrobial agents: Amical 77 was evaluated at levels ranging from two to six pounds per 100 gallons of paint, both with and without the concurrent use of zinc oxide. PMA and competitive nonmercurial mildewcides were also evaluated.

Paint vehicles: The formulations used were standard formulas recommended by latex suppliers and are available on request. The formulations included straight acrylic, alkyd modified acrylic, and vinyl acrylic exterior house paints.

## EXPOSURE TESTING

Application and other test methods were similar to those previously outlined in the discussion of Test A.

TABLE G/EXPOSURE DATA/MILDEW RATINGS (12 MONTHS NORTH VERTICAL FLORIDA EXPOSURE)\*

Mildewcide	Use Level (lbs /100 gal )	Acrylic	Modified Acrylic	Modified Acrylic +50 lbs ZnO	Modified Vinyl +50 lbs ZnO
Control	0	0	0	8	8
Amical 77	2.0	-	-	10	10
Amical 77	4.0	8	7	10	10
Mildewcide "M"	2.0	-	-	10	10
Mildewcide "N"	10.0	8	7	10	10

\*Two coats of latex paint self-primed, applied at a spreading rate of 325 square feet per gallon to a white pine substrate. Scale: 10 = no growth; 0 = complete growth.

## IN-CAN STABILITY (USING PAINTS FROM TEST A)

Tests show Amical 77 will provide in-can preservative action when used at a use level of 0.5% (6 pounds per 100 gallons). At this use level, it is not necessary to add a separate package preservative when Amical 77 is incorporated into the paint for mildewcide activity.

The retained paints used for the Test A exposure studies were examined at 12 and 18 months for pH, viscosity, appearance and odor. Amical 77 at levels of 0.25, 0.5, 0.75 and 1.0% caused:

- No significant change in pH.
- No significant change in viscosity.
- No pigment flocculation.
- No foreign odors.

In a laboratory test, Amical 77 was tested at a 0.5% level in alkyd modified acrylic and alkyd modified polyvinyl acetate exterior paints.

The paints were inoculated with a mixed bacterial culture consisting of *Pseudomonas aeruginosa*, *Escherichia coli*, *Aerobacter aerogenes* and *Bacillus subtilis*, with 150,000,000 cells present per milliliter of inoculum. The bacterial inoculum was added to the sterile paint system at a concentration of 4 ml. per 200 ml. of paint.

Samples of the paint were streaked on nutrient agar petri plates at 4, 24 and 48 hour intervals after introduction of the bacterial inoculum. The plates were incubated for one week at a controlled temperature and humidity optimal for bacterial growth. The plates were observed daily during the incubation period. Results are presented in Table 7.

In this test, Amical 77 at a use level of 0.5% prevented bacterial growth.

These same paint samples were reinoculated and retested one week later using the same procedure. Again, 0.5% Amical 77 prevented bacterial growth.

TABLE 7/AMICAL 77 IN-CAN PRESERVATIVE ACTION

Agent	Paint System	Time After Inoculation		
		4 hours	24 hours	48 hours
Control	Acrylic	Growth	Growth	Growth
0.5% Amical 77	Acrylic	No Growth	No Growth	No Growth
Control	PVA	Growth	Growth	Growth
0.5% Amical 77	PVA	No Growth	No Growth	No Growth

**CAUTION:** Amical 77 has been reported to cause transient yellow color in certain latex paint systems. The problem is more common at higher use levels, in oil modified paints and in systems without zinc oxide. Usually the yellow color disappears in one to three days on exposure to daylight. The color has no effect on mildewcide activity or general paint stability.

Since the amount and persistence of the yellow color depends on the total paint system, it is important that Amical 77 be tested in each formulation of paint in which it is to be used. If color could be a problem, testing, evaluation of Amical 79 or 50 is recommended. Amical 79 contains the same active ingredient as Amical 77, and Amical 50 contains the same active ingredient as Amical 48. However, Amical 79 and Amical 50 also contain effective color suppressants. Please write for Amical 79 and Amical 50 technical literature.

**SAMPLES**

For more information or samples for evaluation, write or phone: Amical, Abbott Laboratories, Chemical Division, D-902, North Chicago, Illinois 60064; (312) 688-5160.

Note: Our recommendations for use of this product are based upon tests believed to be reliable. The data and statements contained herein are based on information received from many sources, and Abbott Laboratories does not undertake to guarantee the accuracy of any information herein set forth. The use of this product being beyond the control of Abbott, no guarantee, expressed or implied, is made as to the effects of such or the results to be obtained if not used in accordance with directions or established safe practice. The buyer must assume all responsibility, including injury or damage, resulting from its misuse as such, or in combination with other materials. Abbott does not assure customers or recipients of the information herein set forth of freedom from infringement of patents owned by Abbott or by others in connection with the use of any product, formula, process or use described herein.

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