

Net Weight:

# AMICAL®-48

No. 5073

## ANTIMICROBIAL AGENT

**CAUTION:** Observe normal safety precautions when handling AMICAL®-48. Avoid breathing dust. Wash thoroughly after handling.

May cause eye irritation with water and can produce skin irritation.

Active Ingredient:	Percent
Diiodomethyl paratolyl sulfone	95
Inert Ingredients:	5
Total	100

AMICAL®-48 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 cautions.



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.

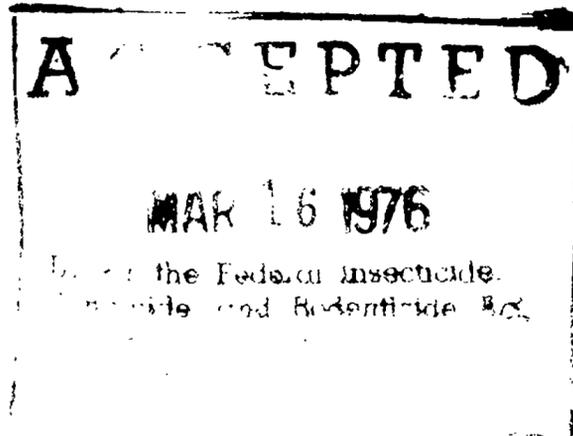
EPA Reg. No. 275-21

EPA Est. 275-IL-1

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Lot No.

01-5218-F4



BULLETIN NO. 75-7

# TECHNICAL INFORMATION



ACCEPTED

MAR 16 1976

Office of the Federal Insecticide,  
Fungicide, and Rodenticide Act,  
Accepted for the pesticides  
registered under  
EPA Reg. No. 275-21

## AMICAL® ALGICIDAL ACTIVITY

AMICAL 48, EPA NO. 275-21  
AMICAL 50, EPA NO. 275-27  
AMICAL 77, EPA NO. 275-22  
AMICAL 79, EPA NO. 275-28

### NOTE

This is a supplement to Bulletins 75-1, 75-2, 75-3 and 75-4, discussing respectively the mildewicide activity of Amical 48, Amical 77, Amical 50 and Amical 79, including physical properties, mildewicide and level recommendations, and safety and handling data.

The purpose of this bulletin is to present the results of our evaluation of the activity of Amical preservatives against a *Cladophora*-like unicellular green alga, isolated from panels coated with latex house paint at recommended mildewicide levels and exposed in Southern Florida for one year.

## AMICAL ALGICIDAL ACTIVITY

### SUMMARY

- Modified acrylic house paints containing Amical 50, Amical 79, Amical 48 and Amical 77 on field exposure in Southern Florida did not support the growth of terrestrial algae. Heavy growth of terrestrial algae was present on paints containing a competitive mildewcide also included in this exposure series.
- In laboratory testing, Amical 50, Amical 48 and Amical 77 prevented the growth of the *Chlorococcum*-like alga isolated from the exposure panels at a concentration of less than 100 ppm.\* Data for Amical 50 indicate the MIC is 80 ppm, using an inoculum concentration of  $1.0 \times 10^4$  cells per ml.

### BACKGROUND

The presence of algae on exterior coated surfaces has become more evident in recent years. Growth conditions include heavy exposure to light and moisture, and the presence of a few mineral salts. Under these favorable conditions growth of algae can become as severe a problem as growth of fungi in warm, moist climates.

Heavy growth of terrestrial algae was observed on sections of several panels on exposure in Southern Florida as part of a comparative evaluation of nonmercurial mildewcides.

The organism was isolated from the panels and used in the following laboratory study.

### LABORATORY EVALUATION (ALGA ISOLATED FROM EXPOSURE PANEL)

#### PROCEDURE

All mildewcides were dissolved in acetone, mixed with 5 milliliters of tempered nutrient agar and poured into 50 millimeter plastic Petri dishes. Control plates contained volumes of acetone equal to the maximum volume added to the test plates.

The cell inoculum volume was 0.5 ml, and contained level of the isolated *Chlorococcum*-like unicellular alga ranging between  $1 \times 10^2$  to  $1 \times 10^6$  cells per ml. Cell concentration was uniform in a given strain.

\*Amical 79 was not included in this evaluation. Activity for Amical 79 is expected to be similar to that for Amical 77, since the active ingredient is the same: p-chlorophenyl diiodomethyl sulfone. Also, no algal growth was evident on field panels containing Amical 79.

The plates were incubated in a 24 X 18 X 20 inch Nalgene box covered with a 3/8 inch Plexiglass cover. Illumination was provided by an 18 inch Gro-lux bulb, placed on top of the cover under a stainless steel hood. The light was cycled 16 hours on, 8 hours off.

Visual evaluations were made using a rating scale of 0 to 4, with higher numbers indicating greater growth.

RESULTS

Minimum Inhibitory Concentration (MIC) data indicate that Amical preservatives are effective against the *Chlorococcum*-like alga at less than 100 ppm. In a study to refine this determination, Amical 50 showed effectiveness at 80 ppm. Please see Tables 1 and 2.

Upon subculture to a nutrient broth, those plates which inhibited growth in Table 1 exhibited no growth after subculture for two weeks, except for the control.

- This evidence indicates that Amical preservatives exhibit algicidal -- rather than algistatic -- properties.

TABLE 1/INHIBITION OF AMICAL 43, AMICAL 50 & AMICAL 77 AGAINST AN ALGA ISOLATED FROM SOUTHERN FLORIDA EXPOSURE PANELS

Compound	Level (ppm)	Inoculum (cells/ml)	Growth Observed		
			3 Days	7 Days	14 Days
Amical 50	1	10 <sup>6</sup>	1	3	4
		10 <sup>4</sup>	1	1	3
		10 <sup>2</sup>	0	1	2
	10	10 <sup>6</sup>	1	3	4
		10 <sup>4</sup>	1	1	3
		10 <sup>2</sup>	0	1	2
	100	10 <sup>6</sup>	0	0	0
		10 <sup>4</sup>	0	0	0
		10 <sup>2</sup>	0	0	0
Amical 48	1	10 <sup>6</sup>	1	2	4
		10 <sup>4</sup>	1	2	4
		10 <sup>2</sup>	0	1	2
	10	10 <sup>6</sup>	1	3	4
		10 <sup>4</sup>	1	1	2
		10 <sup>2</sup>	0	1	2
	100	10 <sup>6</sup>	0	0	0
		10 <sup>4</sup>	0	0	0
		10 <sup>2</sup>	0	0	0

TABLE 1/CONTINUED

Compound	Level (ppm)	Inoculum (cells/ml)	Growth Observed		
			3 Days	7 Days	14 Days
Amical 77	1	10 <sup>6</sup>	1	2	4
		10 <sup>4</sup>	1	1	3
		10 <sup>2</sup>	0	1	2
	10	10 <sup>6</sup>	1	2	3
		10 <sup>4</sup>	1	1	2
		10 <sup>2</sup>	0	1	2
	100	10 <sup>6</sup>	0	0	0
		10 <sup>4</sup>	0	0	0
		10 <sup>2</sup>	0	0	0
Control	0	10 <sup>4</sup>	1	2	4

Rating scale: 0 - 4 with higher numbers indicating greater growth.

CONCLUSION: Amical 50, Amical 48 and Amical 77 are effective as algicides at concentrations of less than 100 ppm (0.1%).

TABLE 2/MIC DETERMINATION OF AMICAL 50 AGAINST A PAINT PANEL ALGA

Amical 50 (ppm)	Growth Observed			
	7 Days	14 Days	21 Days	28 Days
100	0	0	0	0
	0	0	0	0
	0	0	0	0
90	0	0	0	0
	0	0	0	0
	0	0	0	0
80	0	0	0	0
	0	0	0	0
	0	0	0	0
70	0	0	0	1-2
	0	0	0	1
	0	0	0	1-2

TABLE 2/CONTINUED

Amical 50 (ppm)	Growth Observed			
	7 Days	14 Days	21 Days	28 Days
60	0	1	2	2
	0	0	0	1
	0	0	0	1-2
50	0	1	2	3
	0	1	2	3
	0	1	2	3
40	1	3	3	3
	1	3	3	3
	1	3	3	3
30	1	3	3	3
	1	3	3	3
	1	3	3	3
20	1	3	3	3
	1	3	3	3
	1	3	3	3
10	1	3	3	3
	1	3	3	3
	1	3	3	3
0	1	2	3	3

Rating scale: 0 - 4 with higher numbers indicating greater growth.

CONCLUSION: Amical 50 is effective as an algicide  
at a level of 80 ppm.

#### FIELD EVALUATION (EXTERIOR EXPOSURE IN SOUTHERN FLORIDA)

##### DISCUSSION

Modified acrylic latex house paints containing Amical 50, Amical 79, Amical 48 and Amical 77 were applied to white pine panels and exposed in Southern Florida in July, 1973. Competitive mildewcides were also included in this series.

After one year of exposure, a heavy growth of terrestrial algae was present on several panels.

However, the Amical protected paints were algae free.

TABLE 3/FIELD OBSERVATION OF AMICAL ALGICIDAL ACTIVITY

Mildewcide	Level (lbs/100 gal)	Evidence of Algae
Amical 50	2	No growth
	4	No growth
Amical 79	2	No growth
	4	No growth
Amical 48	2	No growth
	4	No growth
Amical 77	2	No growth
	4	No growth
Mildewcide N	10	Heavy growth

TABLE 4/ALKYD-MODIFIED EXTERIOR HOUSE PAINT FORMULATION\*

Materials	lbs.
Hydroxyethyl Cellulose (2.5% Solution)	85.0
Water	68.3
Tamol 850	10.5
Triton CF-10	2.5
Potassium Tripolyphosphate	1.5
Nopco NXZ	1.0
Ethylene Glycol	25.0
Titanium Dioxide	237.5
Magnesium Silicate	241.4
Mildewcide	Varied
Disperse at High Speed	
Rhoplex AC-35	423.0
Long Oil Alkyd	30.8
Cobalt Drier	0.2
Zirconium Drier	0.6
Antimony Hydroxide	2.0
Nopco NXZ	1.0
Tributyl Phosphate	4.6
Water	45.5
Hydroxyethyl Cellulose (2.5% Solution)	20.0

\*In order of addition.

# TECHNICAL INFORMATION

**ACCEPTED**  
**MAR 16 1976**  
U.S. Dept. of the Federal Insecticide,  
Fungicide, and Rodenticide Act,  
registered under the provisions  
EPA Reg. No. 275-21

AMICAL® 48

(EPA REG. NO. 275-21)

PRESERVATIVE FOR LATEX PAINTS

ABBOTT LABORATORIES  
AMICAL® 48  
PRESERVATIVE FOR LATEX PAINTS

NEW ORGANIC CHEMICAL ANTIMICROBIAL AGENT

Amical 48 is one of a series of new preservatives for latex paints. It provides mildewcide activity superior to that of standard mercurials 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 48 preservation:

■ AMICAL 48 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 48 is superior to standard mercurials for mildew inhibition. Refer to the results for Test Program A, page 6.

■ AMICAL 48 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 48 at use levels as low as two pounds per 100 gallons of paint, with the concurrent use of zinc oxide. Amical 48 was compared to competitive mildewcides at the same or lower cost/use levels. Refer to the results for Test Program B, page 8.

■ AMICAL 48 ALSO ACTS AS A PACKAGE PRESERVATIVE.

Amical 48 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 48 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 48 IS EFFECTIVE WITH OR WITHOUT ZINC OXIDE.

Amical 48 does not require zinc oxide to be effective. However, Amical 48 is compatible with zinc oxide. Data show that if you use zinc oxide, lower levels of Amical 48 will be effective.

■ AMICAL 48 DOES NOT ADVERSELY EFFECT 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 48 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 7.

■ AMICAL 48 DOES NOT REQUIRE UNUSUAL HANDLING PRECAUTIONS.

Amical 48 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 48 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 48 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 48 will be needed. Please refer to Table 6, page 3 for specific test results.

TABLE 1/MILDEWICIDE USE LEVELS IN LATEX PAINTS

	Amical 48 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 48 AS AN IN-CAN PRESERVATIVE

When used at a level of 0.5% (6 pounds per 100 gallons) in latex paints, Amical 48 provides in-can preservation in addition to mildewcide activity. Supporting data are presented on page 10.

Additional data about the role of Amical 48 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 48 is reported to have demonstrated in-can preservative activity at a level of 1.20 pounds per 100 gallons of paint.

### WHERE TO ADD AMICAL 48 TO YOUR PAINT SYSTEM

Amical 48 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 48 and disperse five more minutes.
- Avoid heat build up and prolonged mixing.

### PHYSICAL AND MICROBIOLOGICAL PROPERTIES OF AMICAL 48

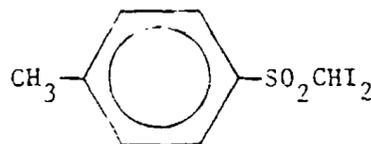
#### PHYSICAL PROPERTIES

Amical 48 is one of a series of newly developed organic chemicals offered exclusively by Abbott Laboratories. Chemically, Amical 48 is diiodomethyl p-tolyl sulfone. Its structural formula and physical properties are summarized in Table 2.

Amical 48 is stable through a pH range of 4.0 to 10.5. In a laboratory evaluation, Amical 48 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 48

Appearance	Fine Tan Powder
Melting Point	147-150°C
Specific Gravity	2.20 g/cc
Bulking Value	5.46 gal/100 lb
Assay	min 95%



#### Minimum Solubility at 25°C (mg/ml)

Water	0.1	Toluene	43
Ethyl alcohol	20	Dimethyl formamide	1000
Isopropyl alcohol	10	Diethyl phthalate	6
Ethylene glycol	10	Diisooctyl phthalate	16
Acetone	350	Dibutyl phthalate	58
Hexane	2	Celliosolve acetate	75
Heptane	3	Carbitol acetate	114
Mineral Spirits	4	Methyl cellosolve	182
Benzene	80	Tributyl phosphate	220
Xylene	33	n-Propyl acetate	263

### MICROBIOLOGICAL PROPERTIES

Amical 48 provides a broad spectrum of antimicrobial activity. Amical 48 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 48
<u>Bacteria</u>	
<i>Staphylococcus aureus</i>	6.2
<i>Pseudomonas aeruginosa</i>	1000
<i>Proteus vulgaris</i>	1000
<i>Proteus mirabilis</i>	1000
<i>Escherichia coli</i>	1000
<i>Salmonella typhimurium</i>	100
<i>Streptococcus faecalis</i>	50
<i>Enterobacter aerogenes</i>	1000
<i>Bacillus subtilis</i>	10
<u>Fungi</u>	
<i>Chaetomium globosum</i>	0.2
<i>Myrothecium verrucaria</i>	0.8
<i>Aspergillus versicolor</i>	0.8
<i>Penicillium citrinum</i>	0.8
<i>Fusarium oxysporum</i>	6.2
<i>Alternaria species</i>	0.4
<i>Rhizopus nigricans</i>	100
<i>Aspergillus oryzae*</i>	1.56
<i>Aspergillus niger*</i>	0.4
<i>Aureobasidium pullulans*</i> ( <i>Pullularia pullulans</i> )	0.78

\*of major interest in paint mildew

### SAFETY AND HANDLING

NORMAL BULK CHEMICAL HANDLING PRECAUTIONS ARE ADEQUATE.

Amical 48 is not dangerous to handle, and requires no unusual handling precautions.

Amical 48 is a very fine powder. Though it is not irritating to the skin, Amical 48 can cause slight, temporary irritation of the eyes.

Though Amical 48 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 48 TOXICOLOGICAL PROPERTIES

Amical 48 Study	Results
Oral LD50	
Mice	10,000 mg/kg
Rats	9,400 mg/kg
Dermal Irritation; rabbits, normal and abraded skin	None
Eye Irritation, Draize Test <sup>(1)</sup>	Slight
Inhalation Toxicity <sup>(2)</sup>	Not Toxic
TL50	
Rainbow trout	0.29 ppm
Bluegills	0.35 ppm

NOTES (1) The pure chemical put directly into the eye causes no corneal damage but can cause slight, temporary irritation. See first aid suggestions below. (2) Amical 48 is not considered a toxic substance when inhaled as defined under 40 CFR 162.8. (3) Amical 48 is toxic to fish. Care should be taken not to contaminate any body of water with Amical 48 by cleaning equipment or disposing of wastes.

### FIRST AID

If Amical 48 gets on the skin, wash area immediately with soap and water. If Amical 48 gets in the eye, flush immediately with copious amounts of water and call a physician. In case Amical 48 is ingested, induce vomiting at once and call a physician.

### AMICAL TEST PROGRAMS

Discussion of three test programs to determine mildewcide activity follows. Two are outdoor exposure studies and the third is a laboratory screening procedure. Also included is a discussion of a study of Amical 48 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 48 MILDEWCIDE ACTIVITY

Test A	Two-year exposure/southern Florida/1969
Test B	Twelve month exposure/southern Florida/1973
Test C	Accelerated laboratory test/Federal Specification 141a, Method 6271.1

## RESULTS OF THE TEST PROGRAM

Amical 48 was found to be a very suitable replacement as a mildewcide for organomercurial products in protective coatings.

Amical 48 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 the Amical 48 is generally superior to phenyl mercuric acetate as a mildewcide in latex paints.
- As a mildewcide, Amical 48 is effective at lower concentrations than phenyl mercuric acetate.
- Amical 48 functions as a package preservative when used at a mildewcide level of 0.5% (about 5 pounds per 100 gallons of paint). Data are presented in Table 3, page 10.
- Amical 48 has no adverse effect on latex paint film durability. It does not increase chalking, cracking or flaking.

#### COMPARE AMICAL 48 WITH STANDARD MERCURIALS.

To provide an indication of the effectiveness of Amical 48 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 48 was evaluated along with phenyl mercuric acetate (PMA) and phenyl mercuric propionate (PMP). Amical 48 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 48 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 48 TWO-YEAR EXPOSURE TESTING (SOUTHERN FLORIDA, 1969)

Agent	Concentration (%)	Mildew	Dirt Pickup	Chalking	Color Change	Cracking	Flaking
ACRYLIC LATEX HOUSE PAINT							
<u>Amical 48</u>							
White	0.5	+			+	+	+
	0.75	+			+	+	+
	1.0	+				+	-
Yellow	1.0			+		+	
Blue	1.0				-	+	
Pink	1.0			-	-	+	+
ALKYD MODIFIED LATEX HOUSE PAINT							
<u>Amical 48</u>							
White	1.0	++		+		-	++
ETHYLENE VINYL ACETATE HOUSE PAINT							
<u>Amical 48</u>							
White	0.75				+		+

TEST B TWELVE MONTH EXPOSURE/SOUTHERN FLORIDA/1973

Test B Conclusions

- Amical 48 is effective in latex paints with or without zinc oxide.
- Lower levels of Amical 48 can be used if zinc oxide is included in the formulation. With 50 pounds of zinc oxide, Amical 48 was effective at a level of 2 pounds per 100 gallons. Control panels with zinc oxide alone were failing.
- Performance of Amical 48 equals that of nonmercurial "M" and nonmercurial "N" on a competitive cost/use basis.

FORMULATIONS EVALUATED

Antimicrobial agents: Amical 48 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 6/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 48	2.0	-	-	10	10
Amical 48	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.

TEST C ACCELERATED LABORATORY TEST/FEDERAL SPECIFICATION 141A

The purpose of this study was to evaluate Amical 48 for mildew resistance by the Federal Specification noted below. Competitive Mildewcide "K" and sodium pentachlorophenate were also evaluated for comparison.

CONCLUSIONS

- Amical 48 definitely afforded superior mildew resistance to latex paint film under the conditions tested than did competitive Mildewcide "K" or sodium pentachlorophenate.
- Amical 48 provided efficacy at a one pound level. The competitive mildewcides were found to be ineffective at the levels used.

PROCEDURE

The study was performed in accordance with Federal Specification Test Method 141a: Method 6271.1, September, 1965, using a mixture of  $1.0 \times 10^5$  spores/ml each of *Aspergillus niger* and *Aureobasidium pullulans*. After seven days of incubation, the specimens were evaluated. Table 7 presents the results of the visual evaluation.

RESULTS

Visual evaluation at seven days illustrated the superiority of Amical 48 over competitive Mildewcide "K" and sodium pentachlorophenate. Amical 48 was found to be effective at a level of one pound per 100 gallons of paint.\*

Mildewcide "M" failed to protect the paint film from mildew growth at and above its recommended use levels.

Sodium pentachlorophenate passed at the 24 pound level, but must have been subject to leaching, since it failed at the same level after leaching.

\*NOTE: This test procedure is not intended to determine specific mildewcide use levels for a particular formulation. A panel study can most accurately perform this function. Federal Specification 141a is a laboratory screening procedure and can be used to indicate comparative efficacy under the specific test conditions

TABLE 7//RESULTS OF FEDERAL TEST METHOD 141A METHOD 6271.1

COMPOUND	USE LEVEL (lbs/100 gal)									
	Unleached Specimens					Leached Specimens				
Amical 48	0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
	0	+	+	+	+	0	+	+	+	+
	0	+	+	+	+	0	+	+	+	+
Mildewcide K		0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0	
		0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	
Sodium Pentachlorophenate		2.0	6.0	12.0	24.0	2.0	6.0	12.0	24.0	
		0	0	0	+	0	0	0	0	
		0	0	0	+	0	0	0	0	
Blank		0				0				
		0				0				
		0				0				

NOTES: In this visual evaluation, (+) indicates passing and (0) indicates failure. A failure is denoted by mildew growth observed across predrawn lines. The paint was an acrylic. The formulation is available on request.

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

Tests show Amical 48 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 48 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 48 at levels of 0.25, 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 48 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 8.

In this test, Amical 48 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 48 prevented bacterial growth.

TABLE 8/AMICAL 48 IN-CAN PRESERVATIVE ACTION

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

**CAUTION:** Amical 48 has been reported to cause transient yellowing in certain latex paint systems. The problem is more common at higher concentrations in oil modified paints and in systems without zinc oxide. Usually the yellow color disappears in one to three days on exposure to daylight. Amical 48 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 48 be tested in each formulation of paint in which it is to be used. If color could be a problem, evaluation of Amical 50 is recommended. Amical 50 contains the same active ingredient as Amical 48. However, Amical 50 also contains an effective color suppressant. Please write for 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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