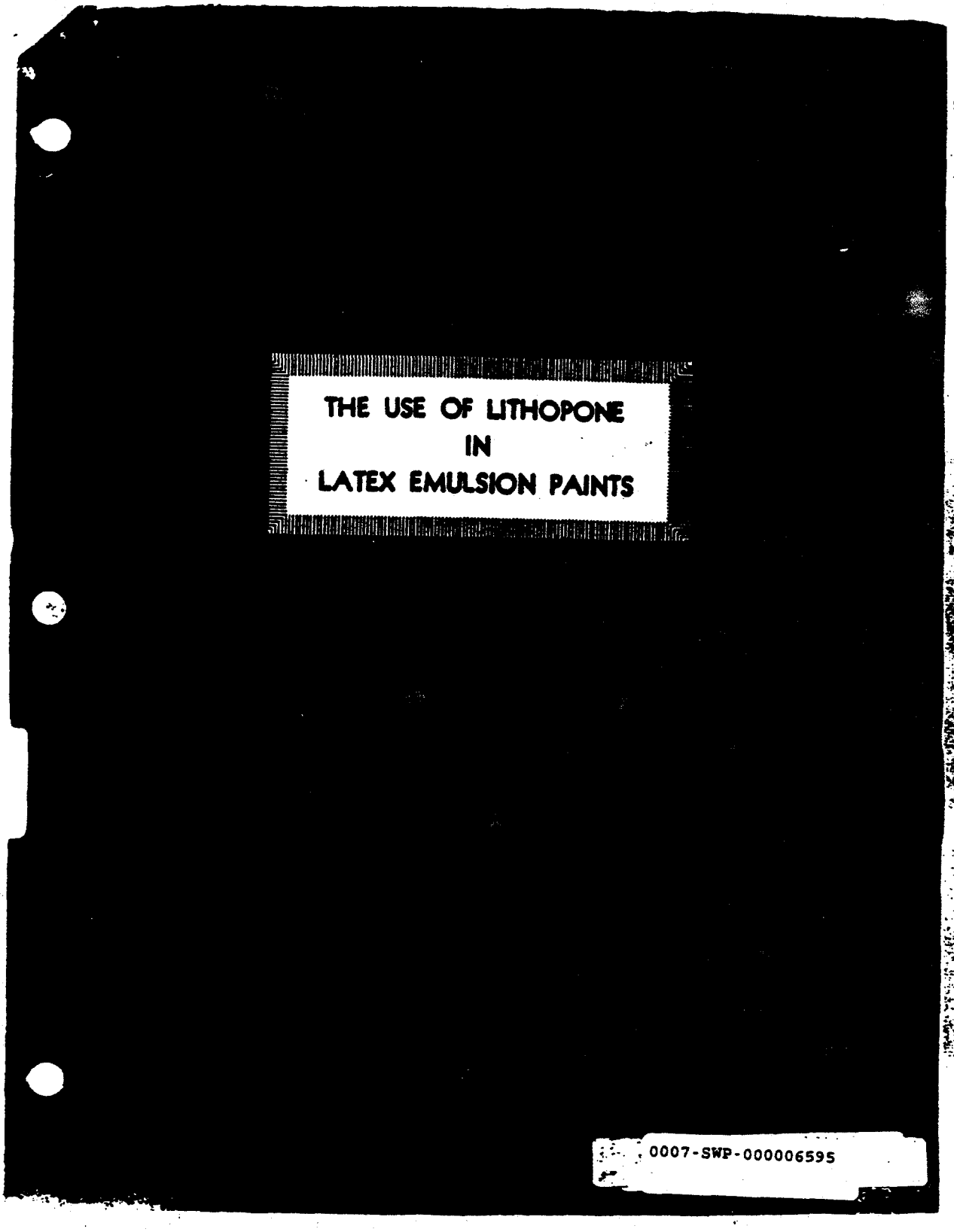
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THE USE OF LITHOPONE IN LATEX EMULSION PAINTS

By

C. H. Adams

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Mineral Products Laboratory
Auxiliaries Research Department
The Sherwin-Williams Co.
Chicago 28, Illinois

THE USE OF LITHOPONE IN LATEX EMULSION PAINTS

Within the span of little more than a year, "latex" paints have become one of the most talked-about paint products on the American market. These paints are being variously promoted as rubberised paint, synthetic latex paint or simply latex paint.

The popular acceptance has been so great that most paint companies, large and small, are either producing a latex paint or are giving serious consideration to the development and production of such a paint.

It is generally recognised that there are more hazards connected with the production and marketing of a latex paint than in the regular line of oil and varnish paints. The difference is represented largely by the difference between an emulsion and a suspension. It is important that suspensions be stable. It is vital that an emulsion like latex paints be stable because once the latex forms a film or becomes continuous, it cannot by any known practical method be brought back into the same emulsion form. A latex paint would, therefore, be considered irreversible.

For the above reasons extra precautions must be taken to insure adequate stability both in the package as well as during application.

Since latex paints as now generally formulated contain proteins, they must be protected from putrefaction. Again, this is extremely important because once putrefaction develops, it is dangerous practice to try to salvage the batch. That old adage, "A little leaven leaveneth the whole lump" certainly is applicable to the putrefaction of latex paints. In stabilizing the paint against putrefaction, the formulator must not be unmindful of the fact that the sanitary conditions existing in the plant may be quite different from those in the laboratory, even though special precautions are and should be taken to insure cleanliness.

Serious consideration should, therefore, be given during formulation to insure good general emulsion stability. Judicious selection and use of pigments and other raw materials will pay multifold dividends in insuring proper emulsion stability and other desired essential properties.

Latex emulsion paints, like protein emulsion paints in general, are sensitive to certain soluble salts and are incompatible with soluble salts of the divalent and trivalent metals. The use of pigments with a reasonably high soluble salt content should be used only after determining that the type of salts is compatible with the emulsion system and used then only with caution, as some of the effects of soluble salts are delayed and may not show up for days or even weeks after application.

Probably no single pigment has contributed more to the success of emulsion paints and latex paints than lithopone. For years the use of lithopone as the prime pigment in emulsion paints was considered essential. Today, the amount of lithopone used per gallon has been considerably reduced, largely for economical reasons, but most formulators retain an appreciable amount of lithopone in their emulsion formulas and in their latex formulas to give them that needed and desired greater factor of safety, as well as to obtain certain desired properties which the formulator hasn't been able to obtain by other means.

These desired properties can be obtained in latex paints at surprisingly slight increase in cost as it is necessary to use only 1/2 to 1# per gallon of lithopone in the whites and light tints and only about 3/4 to 1-1/2# per gallon in some of the darker shades for added protection where needed most. Other formulators for specific desired properties for their paint may, of course, prefer a larger amount.

By actual calculation on practical formulation for whites and light tints, the pigment cost on an equal hiding power basis will be increased from about 1 cent to 2 cents per gallon when using lithopone. (These figures are based on the use of from 1/2 to 1# of lithopone per gallon of paint.) This is a small price to pay for the added factor of safety and improved properties obtained by the use of lithopone.

A review of the desirable properties that lithopone imparts to latex paints and emulsion paints should be worthwhile to formulators:

1. LITHOPONE IMPROVES EMULSION STABILITY IN LATEX AND EMULSION PAINTS, BOTH IN THE PACKAGE AND DURING APPLICATION. As pointed out above, this is an extremely important property and can very easily be the difference between success and failure in the marketing of a latex paint. A formulator should incorporate into his formula sufficient factor of safety to insure stability under as many conditions of storage and use as possible, consistent with practicability. Poor stability may show up also during application or during cleaning of the brush. If a brush is difficult to clean, or becomes sticky during cleaning, it is almost certainly due to instability of the emulsion. Lithopone will go a long ways toward obtaining this desired stability.

2. LITHOPONE IMPROVES DRYING OR SETTING OF LATEX PAINTS. Fast drying or setting of paints is important to permit recoating as soon as possible, whether the job is done by a contractor or a home owner. This is one of the advantages of latex paints in general, but the use of lithopone will generally give further improvement.

3. LITHOPONE IMPROVES THE CURING OF LATEX PAINTS. Latex paints may dry fast to permit early recoating and yet not be cured sufficiently to permit washing and cleaning. Normally, it is not necessary to clean a paint soon after redecorating the walls, for instance, but occasionally this happens. Lithopone aids the curing to permit earlier cleaning of latex paints.

4. LITHOPONE IMPROVES THE WASHABILITY OF LATEX PAINTS. Latex paints are known in general for their excellent resistance to scrubbing. It is also well known that lithopone improves the washability of emulsion paints. Lithopone likewise also improves the washability of latex paint even though the washability may already be very good. The differences in scrubability will be more noticeable before the coated surface has aged appreciably.

5. LITHOPONE REDUCES GHOSTING AT LAPS IN LATEX PAINTS AND EMULSION PAINTS. This condition will, of course, be more noticeable in the darker shades but is quite often a source of trouble even in light shades of certain tints. Sometimes the condition shows up as lap marks. Lithopone normally will help to reduce or eliminate ghosting and lap marks.

6. LITHOPONE REDUCES THE TENDENCY OF LATEX PAINT TO FORM SHINERS OR LOSE GLOSS ON BEING WASHED. Two conditions may happen to a paint film on being washed even though little or no paint is apparently removed. First, the gloss may increase due to the polishing action to form an unsightly "shiner". Secondly, the gloss may decrease and form a "dead" spot. Either is undesirable as quite often the only way the condition can be eliminated is to wash the whole wall.

Lithopone will quite often reduce or eliminate this condition from a formula.

7. LITHOPONE REDUCES SILKING OF A LATEX PAINT. "Silking" is noted when the gloss in the valleys of brush marks is different from the gloss on the ridges. The cause is probably difference in orientation. Lithopone reduces the tendency of latex paint to "silk". The reduction in silking on addition of lithopone can usually be easily demonstrated, even on a white paint, particularly when the paint is applied on a well-sealed surface.

8. LITHOPONE IMPROVES BRUSHABILITY OF LATEX PAINTS. Apparently the brushability of latex paints is as widely different as there are formulas, or possibly one should say as there are degrees of reduction, changes in the history of the sample, and different types of surfaces. All seem to affect the brushing properties of latex paints. Fortunately, however, in spite of the apparent sensitivity to change, latex paints normally can easily be applied satisfactorily by either a professional or an amateur painter. At certain stages, particularly when the paint foams or persistent bubbles develop on brushing, the results may be in doubt but usually any unsightly conditions disappear on drying. The painter normally will, however, not only waste considerable time on prolonged brushing to try to remove persistent bubbles, but may reduce the quality of the paint film by overbrushing. Again, lithopone will help to alleviate the cause and give more uniform and desirable brushing properties.

9. LITHOPONE WILL HELP TO REDUCE OR ELIMINATE THE FLOODING AND/OR FLOATING OF COLORS, EVEN FOR THE DEEP SHADES. Flooding and/or floating can be a source of considerable annoyance to the painter or formulator. The addition of lithopone to the formula will help to alleviate this condition.

10. THE BULKING VALUE OF LITHOPONE IS LOW. The low bulking value of lithopone permits the use of an appreciable quantity or relatively large amount of lithopone in the latex formula to obtain the desired effect without pigment overloading. The low bulking value of lithopone also permits the use of other desirable pigments, including a variety of extenders.

11. LITHOPONE ADDS WHITENING POWER AND HIDING POWER TO THE LATEX PAINT. In spite of the fact that lithopone may affect the formula in many desirable ways, it does, at the same time, add considerable hiding power and whitening power to the formula. In evaluating the use of lithopone in latex paints one should, therefore, take into consideration not only its function as a hiding-power pigment, but also its many versatile functions which can normally be obtained only by the careful selection and use of several extenders.

In spite of the many versatile usages of lithopone in latex and emulsion paints, lithopone cannot be considered as a panacea for all the ills of latex and emulsion paints; neither can lithopone be considered as a substitute for good formulating practice. However, if a formulator is having trouble with his latex or emulsion paint from one or more of the following causes, it is suggested that he try the use of lithopone in the formula to help to alleviate the condition:

1. Instability in the package or on application
2. Drying or curing
3. Poor washability
4. Ghosting or silking
5. Flooding or floating

The following lithopones are recommended for use in latex and emulsion paints. The choice will depend on the formula and the particular property desired.

Permolith W-320. This is a water-wetting type of lithopone that is specially designed for use in latex and emulsion paints. This lithopone contains low soluble salts and is practically free of soluble divalent and trivalent metals. The minimum specific resistance is 3500 ohms and the pH is about 8.00.

Permolith 20L and Permolith 40M. These are regular lithopones with no special additive to obtain certain specific properties. They differ only by oil absorption. Permolith 20L is low oil absorption, and Permolith 40M is medium oil absorption. Both have very low soluble salts and high specific resistance.

Permolith W-421 and Permolith W-560. These lithopones are designed for special properties in latex and emulsion paints. The W-421 gives low consistency in water slurry and the W-560 gives medium high consistency in water slurry. Both are water-dispersible as contrasted with the water-wetting properties of Permolith W-320. These water dispersible lithopones are treated with agents which are compatible with later-emulsion systems. When using either of these lithopones, it is sometimes possible to lower the amount of sequestering agent used in the formula. Both of these lithopones are easy to disperse and are quite often used where minimum milling is desired. The soluble-salt content of these lithopones will be higher, as indicated by specific-resistance test, than the W-320 or the regular types; however, the soluble salts are added to give water-dispersible properties and are compatible with the later-emulsion system.

There are many and varied practical types of latex-emulsion formulas, just as there are many types of house paint formulas. Each type is chosen to meet the need of the particular company as to cost, quality, general and specific properties, and availability of raw materials.

It would, obviously, be impossible to set up a specific latex-emulsion formula that would meet the need and purpose of all formulators. However, a basic formula should serve a useful function as a guide to the formulator. The following formula represents an advanced step toward a final and practical formula for a latex-emulsion paint. It is hoped that it will prove useful as a basic formula:

LATEX-EMULSION PAINT

Top Coat - - Satin Finish

White Finish or Base for Light Tints

Material *	Lbs.	Gals.
Lithopone, Permolith W-320	75	2.10
Titanium Dioxide, Rutile	230	6.60
Mica, (325 Mesh, Water Ground)	35	1.48
Clay	50	2.29
Magnesium Silicate	48	2.01
Casein Dispersion, 15%	140	15.80
Tetra Sodium Pyrophosphate	2	
Water	159	19.03
Antifoaming Agent	7	0.94
Pine Oil	6	0.78
Latex, 48% Solids	425	50.00
	1177	101.03

Wt./Gal.	11.65#	Consistency	80-90 K.U.
pH	8.8-9.0	PVC	35.4%

NVM (by weight) 57.3%

* See "Raw Materials" for identification of materials suggested for use in this formula.

CASEIN DISPERSION

(15% Casein)

Material *	Lbs.
Water	308
Casein, 30 Mesh	75
Antifoaming Agent	15
Preservative 1	6
Preservative 2	6
Borax	5
Ammonium Hydroxide, 26% NH_3	3.3 ±
Water	94
	504.3 #

Wt./Gal. 8.88 # pH 8.5-8.6

NVM 19.5%

* See "Raw Materials" for identification of materials suggested for use in this formula.

MANUFACTURING INSTRUCTIONS

Casein Dispersion. To 300# of water in the mixing tank add, while stirring continuously, 75# of casein and 15# of antifoaming agent. Mix for 20-30 minutes to allow the casein to swell. Add the preservatives and the remaining water. Raise temperature to 135-140°F. Add the borax and most of the ammonium hydroxide. Raise temperature to 155-160°F. Check and adjust pH to 8.5-8.6. Hold temperature at 155-160°F. while agitating for 20 minutes. Readjust batch for any loss of water due to evaporation. Check batch for completeness of dispersion. (The batch should be free of lumps and gellatinous material.)

Latex Paint. Weigh the hot casein dispersion into the paint mixer. Add extenders and enough water to form a good heavy mixing paste. Add the tetra sodium pyrophosphate previously dissolved in a minimum quantity of water. When the mix is uniform, add the lithopone and titanium dioxide and just sufficient water to keep the paste at good milling consistency. Mix until paste is smooth and pass through a suitable type of mill, such as a colloid mill, to the desired degree of dispersion.

Add the antifoaming agent (previously dissolved or emulsified in water) and the pine oil to the milled paste. Mix until smooth. Add the latex with minimum agitation. Check pH and consistency and adjust, if necessary.

RESIN-OIL MODIFICATION

The above latex-emulsion formula should show good emulsion stability in the package, during brushing and also during cleaning of the brush.

The formula lends itself to easy modification with alkyd resins and polymerized oils. (All preferably added at approximately 100% solids.) An appreciable lower cost will result by replacing latex solids with alkyd solids, based on the present market prices. This is an excellent way to extend the mileage of the latex and at the same time obtain possibly lower cost and improvement in certain properties, such as adhesion, brushing, etc. without affecting other desired properties.

Good results should be obtained by replacing 20-35% of the latex solids with an alkyd type, like Dyal XRR-156, or with a modified drying oil type, like Dyal XRR-C-15.

The oil or resin, along with the driers, should preferably be added to the milling paste after the pigments have been thoroughly mixed to a smooth paste.

PASTEL AND DEEP SHADES

The above suggested formula may be tinted for light shades but generally it is preferable for economical reasons to use "bases for tints" for the darker shades so the hiding power and pigment volume can be adjusted. For greater factor of safety, reduction of ghosting, etc. the lithopone content, as previously mentioned, should be increased for the pastel shades and most of the deeper colors. For best results, from 100 to 150# of lithopone should be used per 100 gallons of paint for most pastel shades and deeper tints in place of the 75# recommended for the white. Adjust the hiding power by decreasing the titanium content.

For best results, it is recommended that the colors, whether dry or pulp, be added to the milling paste along with the other pigments and extenders. The pulp colors should be easy enough to grind to cause no excessive heating on being milled. Colors which are difficult to grind may have to be milled in special bases to avoid excessive heating of the protein dispersion. Special bases should, of course, be prepared for use in shading to the final desired color.

RAW MATERIALS

In the suggested formulas the pounds indicated are based on the use of the substance listed first below.

Sequestering Agents:

1. Tetrasodium pyrophosphate
2. Trisodium phosphate
3. Sodium tripolyphosphate
4. Sodium hexametaphosphate

Emulsifying Agents:

1. Polyethylene glycol ether
2. Sodium alkyl aryl sulfonate
3. Glyceryl monoricinoleate

Preservatives:

1. Ortho phenyl phenol, Sodium salt
2. Pentachlorophenol, Sodium salt
3. Chloro-2-phenylphenol

Antifoaming Agents:

1. Sulfonated tallow
2. Pine Oil
3. Tributyl phosphate
4. Glyceryl monoricinoleate

Pigments:

1. Titanium Dioxide, Rutile, Medium non-chalking
2. Lithopone
   a. Permolith W-320
   b. Permolith 40
3. Clay
4. Magnesium Silicate

PIGMENT, CHEMICAL AND COLOR DIVISION

THE SHERWIN-WILLIAMS COMPANY

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300 WEST LAKE STREET, CHICAGO 6, ILL.
101 PROSPECT AVENUE, CLEVELAND 1, OHIO
100 PARK AVENUE, NEW YORK 17, N. Y.
1450 SHERWIN AVENUE, OAKLAND 8, CALIF.

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