A47 LITHOPONE - GENERAL RESEARCH

## Development of an Albalith 362 Type

Summary:

A trial lot of lithopone, Lot C703½, intended to simulate Albalith 362, has been made in the lithopone plant. Tests in the Johns-Manville formula indicate that this run was completely unsuccessful. The Permolith lithopone was found to be materially lower in opacity and in water absorption capacity. The relative hiding powers of the several pertinent lithopones tested were:

| | |
|---|---|
| Albalith 362 | 10 |
| Sunolith 76C | 9 |
| Permolith 60-M | 8 |
| Permolith M-320 | 7.8 |
| Permolith 362 Type | 7 |

There is considerable evidence to indicate that a lithopone of the Albalith 362 type cannot be made by chemical treatment alone; but must be so processed as to permit a very nominal finish dry milling.

### Scope of Problem

The Johns-Manville Company uses lithopone in a resin-emulsion paint which is applied as a coating on their wall board. Up to this time, they have been using a 1:1 blend of Albalith 362 (New Jersey Zinc) and Permolith 60-M at their Natchez, Miss. plant; and a blend of Albalith 362 and Sunolith 76C (Glidden Co.) at the Jarrett, Va. plant. Prior to the time DuPont discontinued the production of lithopone, they had used Ponolith HC instead of Albalith 362. Now that the New Jersey Zinc Co. has likewise discontinued the production of lithopone, they are requesting replacement for the Albalith 362, or alternately for the combination of Albalith 362 and Permolith 60-M. It should be mentioned that Johns-Manville seriously considered reformulating the coating around titanium dioxide, but were dissatisfied with the application characteristics they obtained.

Albalith 362, and Sunolith 76C to a slightly lesser extent, exhibit extra high dry-hiding properties and a very high water absorption capacity. The Johns-Manville formula seems to markedly emphasize this characteristic, and it is especially the hiding property of the Albalith 362 that must be matched. Accordingly, a trial run was made at the Coffeyville Lithopone Plant, duplicating, as nearly as available processing methods and equipment would permit, the procedure used by New Jersey Zinc for the manufacture of Albalith 362.

A sample of this lot, C7034 AUHL 4448, was submitted for evaluation in the Johns-Manville formula. A smaller quantity of Albalith 332 type of lithopone, Lot P7034 AUHL 4449, was made on the same base by adding 0.5% tetrasodium pyrophosphate at the mill. For brevity, these lots will be designated Permolith 362T (for type) and Permolith 332T, respectively.

Evaluation:

A total of six lithopones, alone and in various combinations, were made up in the Johns-Manville formula:

| Lithopone | AUHL No. |
|---|---|
| Albalith 362 (#1) | 4359 |
| Albalith 362 (#2) | 4385 |
| Permolith 362T | 4448 |
| Permolith W-320 | 3370 |
| Permolith 60-H | 2844 |
| Sunolith 760 | 4391C |

Formula:

| | Material | Grams | |
|---|---|---|---|
| | Lithopone | 173 | |
| 6301 | Calcium Carbonate, natural | 154 | |
| 6600 | Anatase Titanium Dioxide | 19.2 | |
| 8265 | Ferrite Yellow, Dk. Orange | 3.8 | |
| * | Protein Emulsion | 220 | |
| 10-C-14 | Dowicide G | 1.5 | |
| | Paraformaldehyde | 1.2 | (Note) |
| (5120) | Water | 192.4 | |
| | Grind in Premier Colloid Mill at 0.005" | | |
| (5120) | Thin-down Water | 115 | |

Note: The paraformaldehyde was actually held out until thin-down because it caused gelling of the paints within 8 hours. Thin-downs were made the day following the preparation of the pastes.

*Protein emulsion

| | Material | Grams |
|---|---|---|
| (5120) | Water | 1694 |
| | Soya Protein, Prosoya L | 254 |
| 4904 | Casein | 169 |
| | Caustic Soda | 14.8 |
| (2016) | Anti-Foam | 17 |
| | Cook 15 minutes at 140°F. | |
| | Refined Soya Oil | 70 |
| | Flexalyn-C | 212 |
| | (Flexalyn C is a diethylene glycol-rosin ester) | |

Two groups of paints were prepared on the above formula, the second group consisting chiefly of a duplication of some of these in the first group. This was done to determine reproducibility of results in the formula. The paints in each series were rated for hiding power by means of combinations of "double draw-downs". These were made on Morest hiding power sheets Form 02A at a gage setting of 6 mils.

| Group 1 Paint No. JM- | Lithopone | Rel. Hiding | Rank |
|---|---|---|---|
| 221 | Albalith 362-1 | 10 | 1 |
| 222 | Permalith 362T | 6.5 | 10 |
| 223 | Albalith 362 + Permalith 60-H | 8 | 5 |
| 224 | Permolith 362T + Permalith 60-H | 7 | 8 |
| 225 | Albalith 362 + Sunolith 76C | 9 | 2 |
| 226 | Albalith 362 + Permalith W-320 | 8.5 | 3 |
| 227 | Permolith 362T + Permalith W-320 | 7.5 | 7 |
| 228 | Permalith 60-H | 8 | 6 |
| 229 | Sunolith 76C | 9 | 2 |
| 230 | Permalith W-320 | 7 | 8 |

| Group 2 Paint No. JM- | Lithopone | Rel. Hiding | Rank |
|---|---|---|---|
| 231 | Albalith 362-1 | 10 | 1 |
| 232 | Albalith 362-2 | 10 | 1 |
| 233 | Permalith 362T | 7.6 | 6 |
| 234 | Albalith 362-2 + Permalith 60-H | 9.5 | 3 |
| 235 | Permalith 362T + Permalith 60-H | 7.9 | 5 |
| 236 | Permalith 60-H | 8 | 4 |

Cross comparisons were also made on the same lithopone in the two groups of paints with these results:

| Paint No. | Lithopone | Hiding Power |
|---|---|---|
| 221/231 | Albalith 362-1 | Equal |
| 222/233 | Permolith 362T | Equal |
| 223/234 | Albalith 362 + Permolith 60-H | Equal |
| 224/235 | Permolith 362T + Permolith 60-H | 235 Very Slightly Higher |
| 228/236 | Permolith 60-H | Equal |

Finally a large number of double drawdowns were made comparing the overall results of Groups 1 and 2. From these comparisons, an average rating was made which varies only slightly from the results of Group 1.

Average Ratings

| Lithopone | Rel. Hiding |
|---|---|
| 1. Albalith 362 | 10 |
| 2. Albalith 362 + Permalith 60-H | 9.2 |
| 3. Sumolith 76C | 9 |
| 4. Albalith 362 + Sumolith 76C | 8.8 |
| 5. Albalith 362 + Permalith W-320 | 8.7 |
| 6. Permolith 60-H | 8 |
| 7. Permalith W-320 | 7.8 |
| 8. Permalith 362T + Permalith 60-H | 7.5 |
| 9. Permalith 362T + Permalith W-320 | 7.3 |
| 10. Permolith 362T | 7 |

Water absorption determinations were made on all the lithopones included in the study; the Gardner-Coleman method was used. Tinting strength values were also run on several of the pigments.

| Lithopone | Water Absorption | Tinting Strength |
|---|---|---|
| Albalith 362 | 32.2 | 94 |
| Albalith 332 | 31.8 | - |
| Albalith 10 | 24.4 | 100 |
| Permolith 362T | 25.5 | 86 |
| Permolith 332T | 22.0 | - |
| Permolith W-320 | 22.5 | - |
| Permolith 60-H | 22.5 | 95 |
| Sumolith 76C | 31.2 | - |

Discussion and Conclusions:

It is apparent that the attempt to manufacture a Permolith lithopone similar to Albalith 362 was unsuccessful. In the Johns-Manville formula, at least, it exhibited no dry-hiding properties whatsoever, and was actually poorer than the regular Permolith 60-H.

In attempting to find an explanation for these results, it is observed that there is some correlation between the dry-hiding and the water absorption (Permolith HC, which had a water absorption of 35-36, showed even better hiding in the Johns-Manville formula.).

Albalith 362 is made on essentially the same base as Albalith 10, yet has about 32% higher water absorption. By contrast, the Permolith 362T has only about 13% higher water absorption than the 60-H. It is suggested that this increased water absorption indicates a particular type of stable pigment agglomeration which acts somewhat like a sponge. This same agglomeration would provide high dry-hiding by retaining air in the interstices of the agglomerates as the film dries. The Permolith 362T, having little dry-hiding property, shows poorer opacity than Permolith 60-H as indicated by its definitely lower tinting strength.

Several conditions are necessary to produce the Albalith 362 type of lithopone. First, the base lithopone must be an extra soft type, kept soft by a deliberate undercalcination. Second, once the special treatment (which is usually a metal silicate coating) is made, both the drying and final milling should be as mild as possible. This is extremely important in order to avoid breaking down the agglomerate structure that has been formed during the special treatment. By drying at a low temperature, the final milling becomes nothing more than a disintegration of the dried cake. It is extremely doubtful whether this type of lithopone can ever be obtained if it is ground in a Raymond ring-roller mill, since this type of grinding tends to disrupt the particle agglomerates. Such a view is supported by the actual processing used by both DuPont and New Jersey Zinc to manufacture the type of lithopone which produced the maximum effect in the Johns-Manville formula.

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