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File 1810

Marshall Laboratory
October 9, 1953

MEMORANDUM REPORT NO. M636

PREPARED BY: J. P. SERMATTEI

CONFERENCE WITH PIGMENTS DEPARTMENT - TITANIUM ORGANICS

Introduction:

Messrs. George R. Seidel and John H. Haslam, Pigments Department, visited Marshall Laboratory on September 21 to present new information on the use of tetrabutyl titanate in finishes. This new information was based on work done by the Titanium Pigment Corporation, a subsidiary of National Lead Company. Some of this information was presented at a Gordon Research Conference which was attended by Mr. Haslam. Additional information is given in a technical bulletin on butyl titanate that has been recently issued

by the Titanium Pigment Corporation, who are offering butyl titanate in experimental quantities at $1.90 per pound.

Present at the conference with the Pigments Department's representatives were:

S. Yolles
C. K. Ikeda
J. L. Evans
R. W. LaBerge
O. R. Volk
S. Hochberg
J. R. Huntsberger
A. C. Buck
S. Horning
H. G. Stauffer
J. P. Sermattei

Summary:

Titanium Pigments Corporation have done considerable research on tetrabutyl titanate and on its use as an additive in finishes of various kinds. In general, it is claimed that tetrabutyl titanate, when added to the extent of about 10% based on the film former, will up-grade coatings by increasing the hardness, speeding the dry, increasing the resistance to solvents, water and alkali, and increasing the dielectric strength. These results are explained by the cross-linking action of the tetrafunctional butyl titanate with OH groups in the film formers with which it is used. This cross-linking reaction occurs rapidly at room temperature, thus providing a cross-linking agent which is effective without baking. Titanium Pigments Corporation claim that tetrabutyl titanate is effective as a cross-linking agent with such film formers as cellulose derivatives, alkyd resins, phenolic varnishes, various vinyl copolymer finishes, Epon resins and others.

In general, the positive claims made for the tetrabutyl titanate are correct, but very little is said about the difficulties involved in using these materials in a practical way. Chief among these difficulties are the increased yellowing, increased film brittleness, gelation or short pot life, sensitivity to moisture, and a capriciousness that makes it difficult to obtain consistent results.

Of special interest was the suggested use of certain solvents, such as the alkanol amines, beta diketones, diacetone alcohol, Cellosolves, ethyl lactate, and ethyl acetoacetate, as chelating agents which inhibit the gelation and increase the pot life of finishes containing tetrabutyl titanate as an additive. The use of butyl alcohol for this same purpose was also stressed. In this case, it is claimed that butyl alcohol acts by reversing the ester interchange equilibrium reaction that occurs when tetrabutyl titanate acts as a cross-linking agent.

Of some interest also, was the suggested use of tetrabutyl titanate in Epon/ethylene diamine finishes. It is claimed that the TBT and ethylene diamine chelate, thereby increasing the room temperature pot life. However, a bake of 30' x 300°F is required to cure this system, which gives it no advantage over other can stable Epon cross-linked systems, such as, for example, an Epon/UF resin system.

Mr. Haslam advised that triisopropyl antimonite can be used to control the yellowing that results from the use of tetrabutyl titanate. We are obtaining a sample. It was also stated that tetrabutyl zirconate is very similar in its general reactivity to tetrabutyl titanate, and is free of the yellowing difficulty, if the zirconate is iron free. A sample is being obtained.

Mr. Seidel advised that J. W. Nestor has under advisement the use of isopropoxy titanium stearate as a waterproofing agent for masonry. Pigments Department has not yet released this product outside the Company for this purpose and will not do so until J. W. Nestor advises as to F & F's interest.

Action:

1. C. K. Ikeda and S. Yolles are preparing a report on the chemistry and finishes applications of the titanium esters, with a view to providing the basis for a management decision as to whether further broad, exploratory work by F & F in this field is justified.

2. S. Hochberg will check the use of triisopropyl antimonite for inhibiting the yellowing that results from the use of tetrabutyl titanate in finishes.

3. S. Hochberg will check the use of tetrabutyl titanate for extending the pot life of Epon/diamine finishes.

4. J. L. Evans will investigate Epons cross-linked with tetrabutyl titanate as undercoats for OA.

5. O. R. Volk will investigate the use of tetrabutyl titanate to improve the wrinkle resistance of floor enamels based on RC-462 (a 60% soya oil alkyd).

Discussion:

More detailed information is given in the technical bulletin on butyl titanate prepared by Titanium Pigments Corporation, and also in the notes prepared by Mr. Haslam covering the papers

presented at the Gordon Research Conference. Copies of these were distributed to each person at the conference and are also attached to the file copy of this report. For this reason, there is no need of any further detail here.

MARSHALL LABORATORY

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JPS:mw
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