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INTER-OFFICE MEMORANDUM

DATE: March 19, 1970

TO: Mr. R. C. Bacon

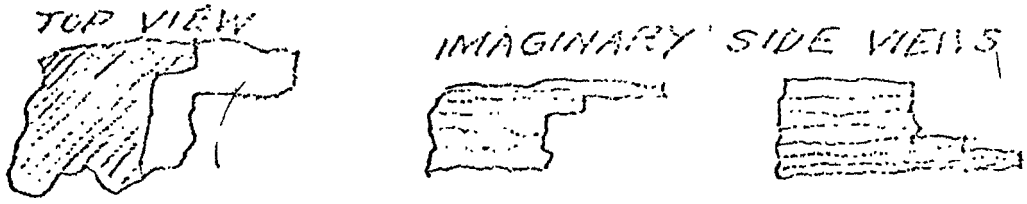
FROM: Dr. R. M. Husband

SUBJECT: Photomicrographs of MESTAL 101, 201, 301, 303, 401 - 404, & VANSIL® MG.

Here are the electron-photomicrographs from Ernest F. Fullam, Inc., and some light photomicrographs made by Mr. E. Slawson in our laboratory. Their dispatch to you has been delayed by a problem that has taken Slawson away from the lab during several recent days.

You will observe that the light photomicrographs are not properly in focus. This stems, I believe, from the limitations of our most elementary equipment and Slawson's limited experience. However, I think they are sufficient to give some better view of the range of particle sizes within one sample and some comparison of the different samples. Note that they magnify the particles 930 times.

Each of the electron micrographs shows the presence of large irregularly shaped particles (up to 21μ or so in at least one dimension) which are probably multi-plate (multi-layer) particles. Each also shows the presence of many thin translucent to transparent plates ranging in size from about 5μ x 7μ down to minute specs about 0.1μ square. Some particles indicate irregular fracturing of different layers of multi-layer particles (see particle A,-Talc E, Talc F.) which may be illustrated in this way:



There are many places where thin plates may be seen overlying other thin plates, partially or wholly, in such a manner that it is easy to think they are not attached to each other.

Each sample shows some amount of material in the form of relatively thin rod-shaped particles. Though some of these rods may be narrow slivers broken from multi-plate particles, some do not appear to fit such a description and may be a fibrous form of talc or some other mineral. Note especially the two light micrographs of VANSIL® MG. The one marked "Normal Field" is the view at the center of a smear formed from VANSIL® MG suspended in alcohol. The other shows the view at the edge of the smear where many rods are clustered together because their interrelations to the suspending alcohol differed from those of the other particles.

The light micrographs reveal that the more coarsely ground products contain a greater proportion of larger particles than do the finer grinds -- WESTAL® 401 - 404, VANSIL® MG. And the electron micrographs emphasize the great range of particle sizes even though they exclude the largest sizes.

Considering the ranges of particle sizes, I am forced to wonder the following:

1. How do the spectra of particle sizes change with the grinding and separatory modes? Do the pictures of WESTAL® 401 - 404 and of VANSIL® MG compare differing grinding and separatory procedures on the same ores or on different ores? Or, do they reveal the result of differing processing modes on different ores? It should be revealing to follow the change in particle size distributions during fluid energy milling compared to, say, mechanical impact milling.

2. What are the relations of other supposedly evaluative measurements and of the utilities of the products to the spectra of particle sizes? I suspect that VANSIL® MG would serve the better in TiO_2 extension, the less the incidence of thick or multi-plate particles and the more uniform and smaller the plate sizes-- so long as they were not reduced below some unknown minimal size which might be of the order of $0.5\mu^2$. Indeed, we are examining the relations involved in the extension of TiO_2 with VANSIL® MG and may be able to pass better opinion about this point before long.*

For use as a paper filler, there might be no virtue in uniformity of particle size. A range of sizes might serve the better, perchance.

Some people are quite skeptical of the representation of particle size distributions provided by the common sedimentation techniques upon some materials such as talcs. These pictures would probably reinforce their skepticism.

Likewise, it is easy to assume that other end uses might be served the better or poorer with change of particle size distribution. Of course, if there is no convenient and economic way to change the distributions, the questions and assumption is irrelevant; but it would be more that surprising if the practical utilities of products could not be related, with study, to sizes of the particles and their chemical characteristics.

* Realize that each large multi-layered particle could provide many small and thin platelets, each of which could serve to separate TiO_2 particles. It is in this way too that a talc that can be extensively taken apart into small platelets can have a very much larger surface area per unit weight.

RMH:amt
enc.
cc/ Mr. H. W. Howard, RMH-WLC