Quality Control of Mineral Pigment/Coating Blends Displaying Different Mineralogical Structure/Shape

This article was written for the MicroReport by Vilho, J [(1)], Santos, N [(2)], Gomes, C[(1)]
[(1)]Departamento de Geociences, Universidade de Aveiro, 3810 Aveiro, Portugal
[(2)]Instituto Politenico de Tomar, 2300 Tomar

email: Jvelho@teleweb.pt

The purpose of this experiment was to study two distinct mineralogical structures of calcium carbonate that are blended in different proportions into composites for use in paper coating. Surface area and particle size measurements were used to characterize the composites.

Samples of ground calcium carbonate with rombohedral mineralogical structure (G) and of precipitated calcium carbonate with scalenohedral mineralogical shape (E) were analyzed individually and as blends of different proportions to determine their usefulness in paper coating. The blends were made according to the following formulations: 75G:25E (B1), 50G: 50E (B3) and 25G:75E (B5). Sample E possesses particles grouped in clusters (soft aggregates), that give the material a very effective texture for light scattering measurements.

With all samples having particles of very distinctive mineralogical structure, the problem was not only confined to determining the best combination/proportion of the two materials in a given blend, but also in finding the appropriate analytical technique(s) that can react to the corresponding variability in particle shape. Hence, specific surface area as determined with The ASAP-2000, as well as particle size distribution measured by The SediGraph 5100 were used.

In regard to specific surface area, experimental data were compared with theoretical data, considering that samples G and E

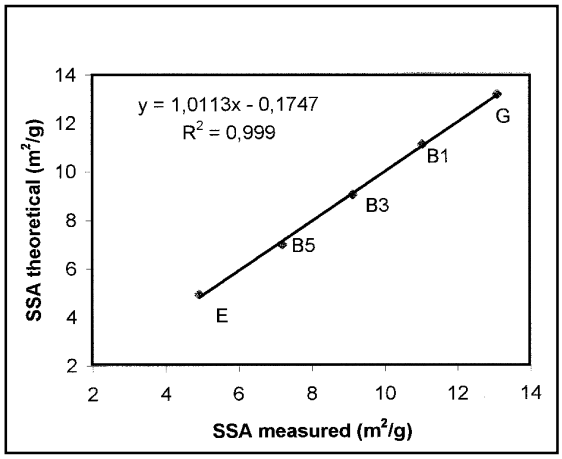

Figure 1. Specific surface area data.

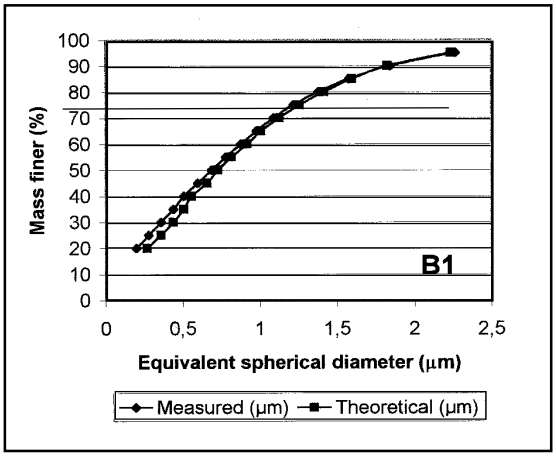

Figure 2. Particle size distribution curve of B1 blend.

data are of known standards (Figure 1).

In regard to particle size distribution, the same reasoning was considered (Figures 2, 3, and 4).

Measured and theoretical results obtained for the specific surface area were found, for all practical purposes, to be in full agreement. On the other hand, particle size distribution measurements of the blends, showed minor deviation from those predicted according to theory.

Figure 5 shows the correlation between the measured and theoretical light scattering coefficient (LSC) of the resulting coated paper. The calculated correlation coefficient indicates that the blends were well prepared and that LSC is directly proportional to the proportion of sample E in the blend used for paper coating.

Conclusion

In conclusion, we can state that through these very simple quality control methods, it is possible to use accurate measurements to characterize pigment/coating blends that go in paper coating formulations. The instruments used demonstrated exceptional ability to provide the parameters needed for purposes of this research.

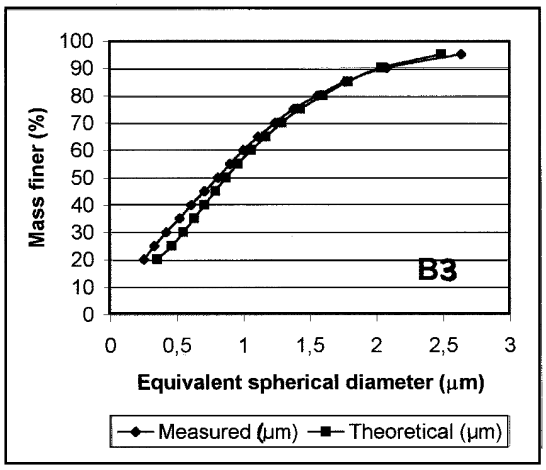

Figure 3. Particle size distribution curve of B3 blend.

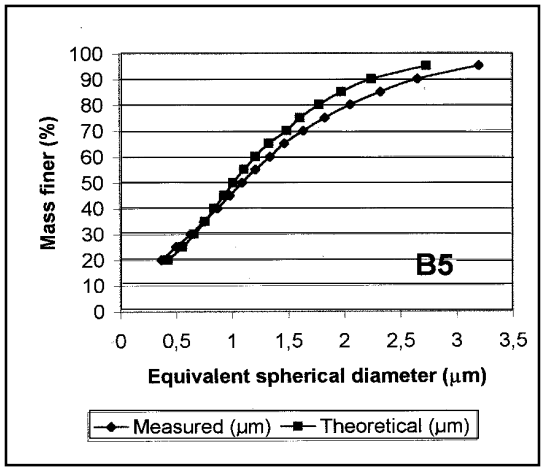

Figure 4. Particle size distribution curve of B5 blend.

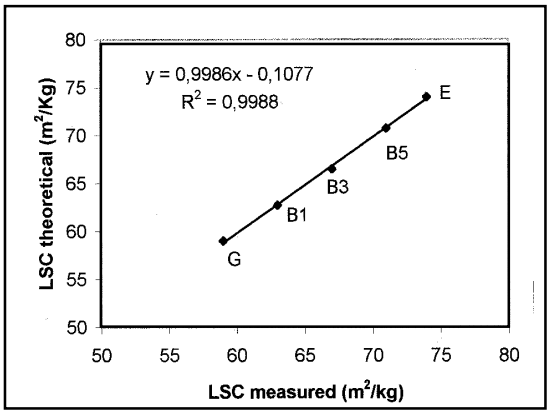

Figure 5. Light scattering coefficient data.