Guidelines on the influence of the pigment particle size on the comparison of sparkle

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Special-effect pigments provide a change in color with viewing and illumination direction. Besides this angular dependence on viewing/illumination direction, metallic finishes also exhibit a visually complex texture. Depending on the properties of the finish and the viewing and illumination conditions, the flakes exhibit a sparkle like texture [1].

Nowadays, there is only an instrument on the market to measure the effects of texture, the multi-angle spectrophotometer BYK-mac. In particular, to measure the sparkle effect, the sample is illuminated directionally under 15º, 45º and 75º counted to the normal on the sample surface, and in order to measure the graininess effect the sample is diffusely illuminated by means of an integrating sphere. The photographed gray-scale pictures are internally used to calculate texture parameters. Three parameters are obtained for characterizing the sparkle: sparkle intensity (Si), sparkle area (Sa) and sparkle grade (S_G) for the three directional geometries. The total size of the small and bright areas per unit area is called sparkle area. The sparkle intensity is specified as the intensity of the small and bright light spots in relation to the intensity of the less bright surrounding. The sparkle area and the sparkle intensity are combined in the representative sparkle attribute called sparkle grade. For the diffuse illumination, a parameter (G) is calculated to characterize the graininess effect. For this reason, the byko-spectra effect (BSE) by BYK-Gardner was

This report summary the results from D5.5.4 to propose a guideline on the influence on the pigment particle size on the sparkle detection.

The psychophysical method used was the method of adjustment. This method gives permission to the observer to control the level of the stimulus, instructs him to alter it until it is just barely detectable, in this case, the subject must adjust or manipulate freely the intensity of the stimulus (sparkle), until it is able to perceive it or to stop perceiving it, by adjusting the distance at which the texture effect is detected. Six evaluations per sample were done by each observer, three replications in which the observer was moving away from the sample and three in which the observer approached the sample to detect sparkle.

The number of samples used was equal to 18 samples. They were divided into two sets, basically differentiated by their chroma, nine chromatic metallic samples (silverdollar) and nine achromatic metallic samples (cornflake) with different average sizes (D50) between 9 and 35 µm. In this visual experiment, 12 observers, with normal color vision and visual acuity, participated in this experiment (6 men and 6 women). Each observer

performed 324 visual judgments between both subsets of samples, for a total of 3888 visual judgments (15ºx0º, 800 lux).

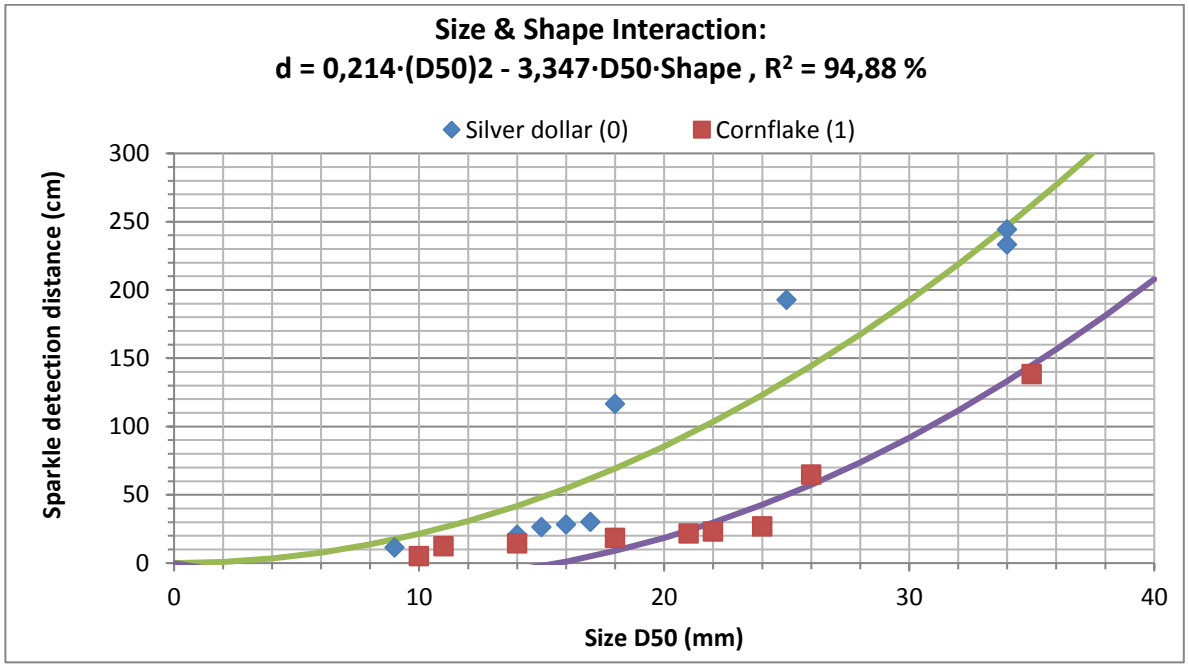

Figure 1. Relationship between the pigment particle size and the sparkle detection distance.

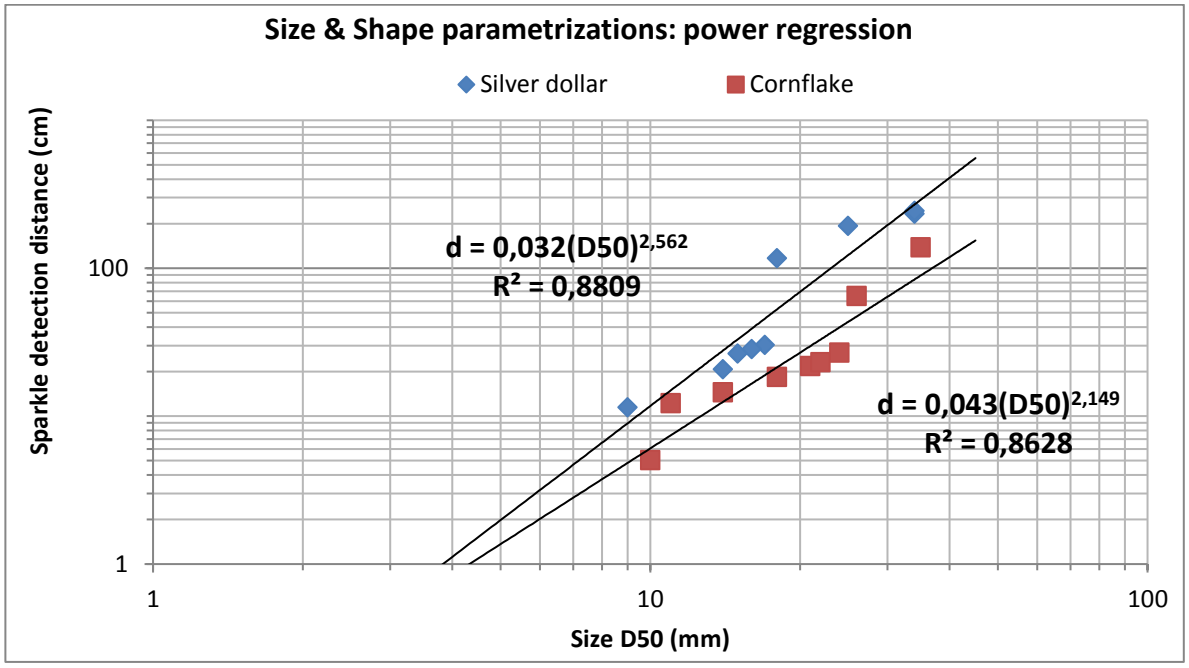

Figure 2. Relationship between the pigment particle size and the sparkle detection distance by isolating the pigment shape.

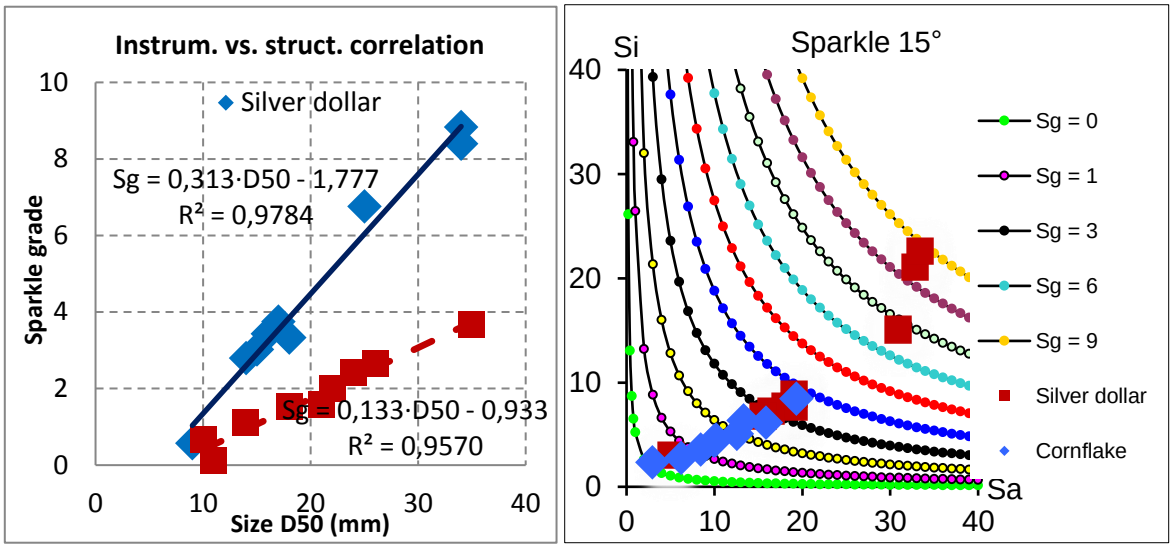

Figure 3. Relationship between the pigment particle size and the sparkle grade.

GUIDELINES

- Pigment size (D50) is more important than shape:
  - sparkle grade has a linear relationship with pigment size.
- Pigment shape is important to consider:
  - Silver dollar more easily detectable than cornflake
- Isolated regressions according to shape:
  - Power regression for d = f(D50) is valid and coherent
  - Exponential growth modelling d = f(sparkle value) is valid for instrumental correlation (Sg , Si , Sa)