Opacity Pigment Functionality

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Opacity Pigment Functionality

A unique combination of TiO$_2$ encapsulated and spaced within a shell of calcium carbonate.

A product composition and morphology that differentiates it from anything else on the market.

A combination of multiple light scattering techniques in one product.

A simple to use, cost effective, partial replacement for TiO$_2$ pigment.

Optimise Without Compromise
Opacity Pigment Functionality

Summary of Functionality

- Multiple scattering effects in one particle
- Unique structure containing TiO$_2$ prevents “window” effect in film
- Improved spacing of TiO$_2$ encapsulated in the composite improves scatter
- Diffuse surface reflection and unwetted surface boost opacity and brightness
- “Dilution” of TiO$_2$ numbers gives the potential to increase nearest neighbour distance

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 opacity Pigment Functionality
Titanium Dioxide, Precipitated Calcium Carbonate and Air combined through our patented technology to produce a composite with multiple benefits.

Both paints on the left contain a volume concentration of 5% TiO$_2$ and 32% PCC, the only difference is the FP-Pigments process vs a dry blend.

The 2 unit increase in opacity for the FP-460 is indicative of the better TiO$_2$ spacing within the FP-460 particle.

37% pvc silk paint at 35% volume solids
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The TiO$_2$ within the PCC composite scatters light unlike the extender which acts as a “window” to light in the coating increasing the probability that it will reach the substrate and thus reduce coating opacity.

The refractive indices of extenders are significantly lower than that of TiO$_2$. With a much lower refractive index more of the light entering the film can penetrate through to the substrate. This is observed as a weaker hiding power and can be thought of as adding “windows” in the film. The TiO$_2$ within the FP particle significantly reduces this “window” effect.
The rough surface of the Opacity Pigment produces a high level of diffuse surface reflection. This effect contributes to overall opacity and film brightness.

Incomplete wetting of the surface by the binder leads to surface air pockets which enhance the light scattering through greater refractive index changes.

<table>
<thead>
<tr>
<th>Interface</th>
<th>RI Difference</th>
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</thead>
<tbody>
<tr>
<td>CaCO₃ and Binder</td>
<td>1.63 – 1.49 = 0.140</td>
</tr>
<tr>
<td>Binder and Air</td>
<td>1.49 – 1.0008 = 0.489</td>
</tr>
<tr>
<td>CaCO₃ and Air</td>
<td>1.63 – 1.0008 = 0.629</td>
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</tbody>
</table>
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When replacing by weight, less than 4% of the TiO$_2$ particles removed are added back as FP Particles. In effect, we are diluting the number concentration of TiO$_2$ particles.

For a 17% TiO$_2$vc, 51% Evc paint, a film 200 x 100 x 100µm contains approximately 24 million TiO$_2$ particles. A 15% replacement by FP-Pigment reduces the number of TiO$_2$ particles to ~20 million but adds back only ~135000 FP-Pigment particles.

With fewer TiO$_2$ particles, the inter-particle distance will be increased. In the Standard the distance between TiO$_2$ particles is calculated as ~70nm while in the 15% FP paint it has increased to ~ 91nm - a 30% increase in spacing.
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