



enhanced  
by Omya

# Enhancing Titanium Dioxide

with Calcium Carbonate

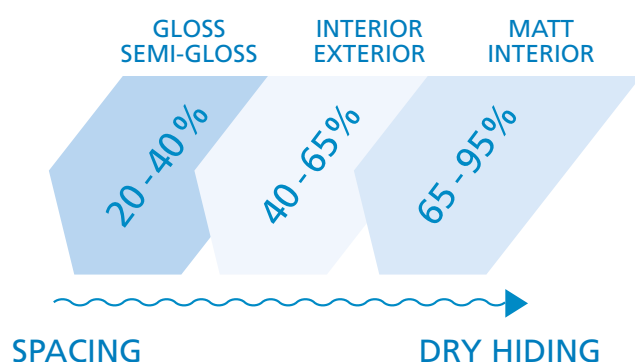


THINKING OF TOMORROW



# Unique Portfolio of Titanium Dioxide Performance Enhancers

OPACIFYING CALCIUM CARBONATE FILLERS HELP TO DEVELOP THE FULL POTENTIAL AND PERFORMANCE OF YOUR TITANIUM DIOXIDE IN A WIDE RANGE OF WATER BASED AND SOLVENT BASED PAINT FORMULATIONS.



*By dry hiding*  
*By spacing*

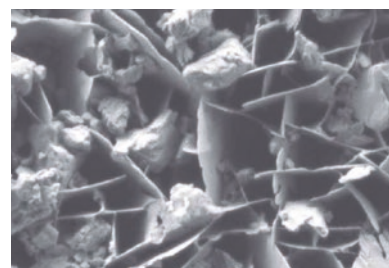
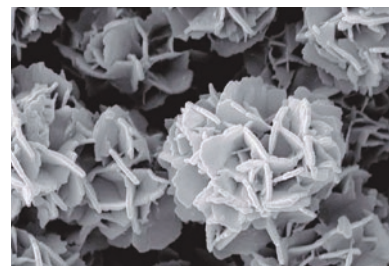
## Dry Hiding & Opacity

Dry hiding and opacity are determined by the result of a series of complex interactions. These properties are significantly influenced by the amount of titanium dioxide, extender type, size, and volume, pigment volume concentration, spreading rate, and porosity. Each of these factors have a direct impact on light absorption, scattering, and reflectance, which are also contributors to the hiding power.

Entrapped air in a paint film also contributes to dry hiding and opacity. This is possible in formulations that do not contain titanium dioxide, due to the interfaces between filler particles and air providing sufficient difference of refractive indices; this effect is called dry hiding. This type of dry

hiding is typically observed in paints with pigment volume concentration (PVC) above the critical pigment volume concentration (CPVC). These formulations typically result in poor wet hiding, since the air voids in the paint film are filled with water.

Omyabrite® 1300 modified calcium carbonate provides excellent dry hiding and opacity over a wide PVC range in matt emulsion paints due to its porous structure. Omyabrite® 1300 is a unique opacifying filler produced with patented Omya MCC technology based on natural ground calcium carbonate. Omyabrite® provides an opportunity for significant reduction of the TiO<sub>2</sub> content in a broad PVC range of emulsion paints without compromising dry hiding and opacity.



# Omyabrite® 1300

The following starting paint formulation is an example of the potential for TiO<sub>2</sub> reduction. High quality dead matt interior emulsion paint, pvc = 65%; Significant reduction of TiO<sub>2</sub>, and replacement of PCC provides the ability to lower total formula raw material cost, and also results in a lower carbon foot print.

Raw Material			Control	Optimized
			Parts by weight	
Water and additives			27	27
Titanium dioxide			19	15
Omyacarb® 1			7	14
Omyacarb® 10			13	10
PCC			10	-
Modified Alumino-Silicate			3	3
Omyabrite® 1300			-	10
Styrene acrylic dispersion 50%			21	21
Total			100	100
PVC	%		65	65
Density solid	g/ml		2.33	2.29
Density liquid	g/ml		1.58	1.57
Volume solids per litre	ml/l		420.6	425.2
Solids content by weight	%		63.1	63.1

Brightness/Opacity/Sheen (Gap 150 µm)			Control	Optimized
Ry at C2°	DIN 53 145	%	91.7	91.6
Ry over black at C2°	DIN 53 145	%	89.4	89.1
Yellowness Index	DIN 6167		3	3.2
Contrast ratio	DIN ISO 6504-3	%	97.5	97.3
Gloss 85°			1	1.1

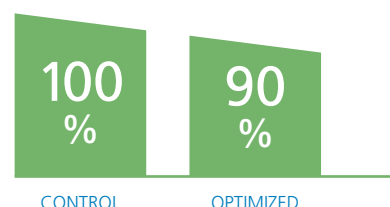
  

Contrast at 7.5 m²/l acc. EN 13300				
Contrast ratio at 7,5 m²/l	EN 13300	%	98.7	98.5
Contrast ratio class at 7,5 m²/l	EN 13300	Class	2	2

Mechanical properties acc. ISO 11998				
Loss of thickness, 200 cycles	ISO 11998	µm	4.5	4.6
Wet scrub resistance Class	EN 13300	Class	1	1

## Reduction of CO<sub>2</sub>



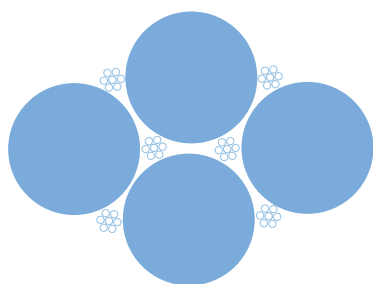
Natural Products  
for Sustainability

# Spacing of Titanium Dioxide

The extraordinary hiding power of titanium dioxide is due to its high refractive index; 2.7 for Rutile, and 2.55 for Anatase  $\text{TiO}_2$ . In addition to refractive index, particle size is an important factor for the performance of  $\text{TiO}_2$ . Ultrafine and sub-micron fillers based on natural ground calcium carbonate are able to prevent re-agglomeration, or

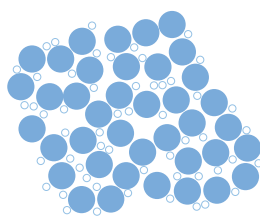
crowding of  $\text{TiO}_2$  particles in the paint film by spacing the  $\text{TiO}_2$  particles.

Titanium dioxide spacing is most efficient in paint systems formulated below critical pigment concentration, and containing relatively high  $\text{TiO}_2$  contents.



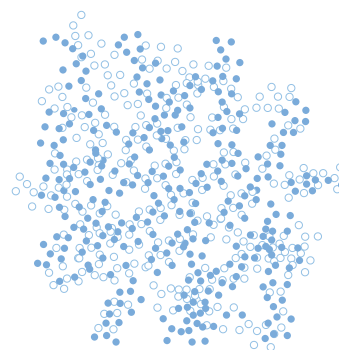
0.3µm  $\text{TiO}_2$ -particle

5µm filler particle



0.3µm  $\text{TiO}_2$ -particle

0.9µm filler particle



0.3µm  $\text{TiO}_2$ -particle

< 0.5µm filler particle



**Smaller particle size**

**Improved spacing effect**

Omyacarb® Extra and Omyacoat®, are well known trade names of our range of ultrafine calcium carbonates. These products are the benchmark for ground calcium carbonate spacing fillers.

Each product is tailor made for a specific application;

Omyacarb Extra® provides excellent properties in both, emulsion based decorative paints and solvent based industrial coatings.

Omyacoat® 420 is a superior choice for water based and solvent based systems as a versatile opacifier with an outstanding price performance ratio.

# Omyacarb® Extra - KA

## IN HIGH PVC MATT DECORATIVE PAINTS

The use of Omyacarb® Extra - KA allows an optimization of the titanium dioxide content based on the opacifying effect provided by its ultra fine particles. In formulations above the critical pigment volume concentration the titanium dioxide content can be significantly reduced without compromising the dry opacity.

Omyacarb® Extra - KA can be used in matt and semimatt paints. In formulations with very low Sheen levels of 2% (example given below) it is recommend to combine Omyacarb® Extra - KA with a coarser product. The reformulation was done at similar pigment volume concentration = 73% which is above the critical PVC.

Omyacarb® Extra - KA allows formulators to reduce binder content by having a better filler packing in the system.

Raw Material	Control	Opti-mized 1	Opti-mized 2
	Parts by weight		
<b>Water and Additives</b>	42	44.7	42.5
<b>Tronox CR 813</b>	6	5.3	5.0
<b>Omyacarb® 2</b>	32	-	-
<b>Omyacarb® 5</b>	9.5	25	28.8
<b>Omyacarb® Extra - KA</b>	-	15.5	15
<b>ENCOR 2322. 50%</b>	10.5	9.5	9
<b>Total</b>	100	100	100
<b>PVC %</b>	76.5	78.8	80.0

Brightness/Opacity/Sheen (Gap 150 µm)			Control	Opti-mized 1	Opti-mized 2
<b>Ry at C2°</b>	DIN 53 145	%	91.2	91.2	90.1
<b>Ry over black at C2°</b>	DIN 53 145	%	84.4	85.1	85
<b>Yellowness Index</b>	DIN 6167	-	2.6	2.7	2.7
<b>Contrast ratio</b>	DIN ISO 6504-3	%	92.6	93.3	94.4
<b>Gloss 85° 150 µm gap</b>	EN ISO 2813	-	2.9	3	3.3
Contrast ratio at 7.5 m²/l	EN 13300	%	95.8	95.9	96.8
Contrast ratio class at 7.5 m²/l	EN 13300	Class	3	3	3

### Mechanical properties acc. EN 13300

Wet scrub resistance Class	EN 13300	Class	4	4	4
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- *Omyacarb® Extra-KA improves the efficiency and enables reduction of titanium dioxide*
- *Optimization of binder content*
- *Very good dispersibility in water based matt to semigloss paint systems*

# Omyacarb® Extra - KA

## IN LOW PVC SEMI GLOSS DECORATIVE PAINTS

Raw Material	Control	Optimized
	Parts by weight	
Water, solvent and additives	30.5	36.0
Tiona 595	23.5	22.5
Omyacarb® 1	11.0	-
Omyacarb® Extra - KA	-	10.50
ENCOR 2425, 50%	35.0	32.0
<b>Total</b>	<b>100</b>	<b>100</b>
PVC %	38.1	38.3



Brightness/Opacity/Sheen (Gap 150 µm)			Control	Optimized
Ry at C2°	DIN 53 145	%	92.1	92.0
Ry over black at C2°	DIN 53 145	%	88.4	88.3
Yellowness Index	DIN 6167	-	0.9	0.6
Contrast ratio	DIN ISO 6504-3	%	96.0	95.8
Gloss 60° 150 µm gap	EN ISO 2813	-	9.3	10.8
Gloss 85° 150 µm gap	EN ISO 2813	-	32.9	57.8

Omyacarb® Extra - KA is designed to enhance the performance of TiO<sub>2</sub> in a wide range of gloss levels. It shows excellent dispersibility in both water and solvent based systems.

Omyacarb® Extra – KA provides a possibility to improve Low PVC semi-gloss water based paints. A 1:1 replacement of a standard fine GCC by Omyacarb® Extra – KA leads to higher gloss and to a possibility to optimize the TiO<sub>2</sub> and binder content.

- *Omyacarb® Extra - KA allows a reduction of titanium dioxide*
- *Omyacarb® Extra - KA improves filler packing and allows optimization of binder content*
- *Omyacarb® Extra - KA improves gloss properties by its ultrafine particles*

# Omyacarb® Extra - KA

## IN HIGH GLOSS DECORATIVE PAINTS

Omyacarb® Extra - KA is a universal UFGCC filler can be used both in water and solvent systems with its excellent dispersibility.

Omyacarb® Extra - KA outperforming properties gives excellent results also in Alkyd based paints. Reduction of TiO<sub>2</sub> without changing gloss and contrast ratios allow formulators to enjoy cost savings.

- *Omyacarb® Extra - KA improves the efficiency and enables partial substitution of titanium dioxide*
- *Omyacarb® Extra - KA improves gloss and hiding power properties by its ultrafine particles*

Raw Material	Control	Optimized
	Parts by weight	
Plusol S 65 S, 70 %	50	50
PARALOID™ B-67 /50 % WS	5	5
Tiona 595	25	22.5
Omyacarb® Extra - KA	-	4
Solvent and additives	20	18.5
<b>Total</b>	<b>100</b>	<b>100</b>
PVC %	15.3	17

Brightness/Opacity/Sheen (Gap 150 µm)			Control	Optimized
Ry at C2°	DIN 53 145	%	87.2	87.1
Ry over black at C2°	DIN 53 145	%	84.3	84.2
Yellowness Index	DIN 6167	-	3.8	3.9
Contrast ratio	DIN ISO 6504-3	%	96.8	96.7
Gloss	-			
Gloss 20°	EN ISO 2813	-	82.9	81.9
Gloss 60°	EN ISO 2813	-	91.9	91.8



## Omya Construction

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