



# TiO<sub>2</sub> Composite Pigments for Powder Coatings



## ChemQuest Powder Coating Research

*“ChemQuest Powder Coating Research has thoroughly tested TiO<sub>2</sub> Composite Pigments and has found them to provide excellent extension of titanium dioxide and also improved dispersion of tinting pigments. These enhancements come with no reduction in gloss, durability or mechanical properties of the film.”*



**Kevin Biller, President**  
[www.powdercoatingresearch.com](http://www.powdercoatingresearch.com)



# “Optimize Without Compromise”

## FP-Pigments



Global manufacturer of TiO<sub>2</sub> Composite Pigments and speciality minerals.

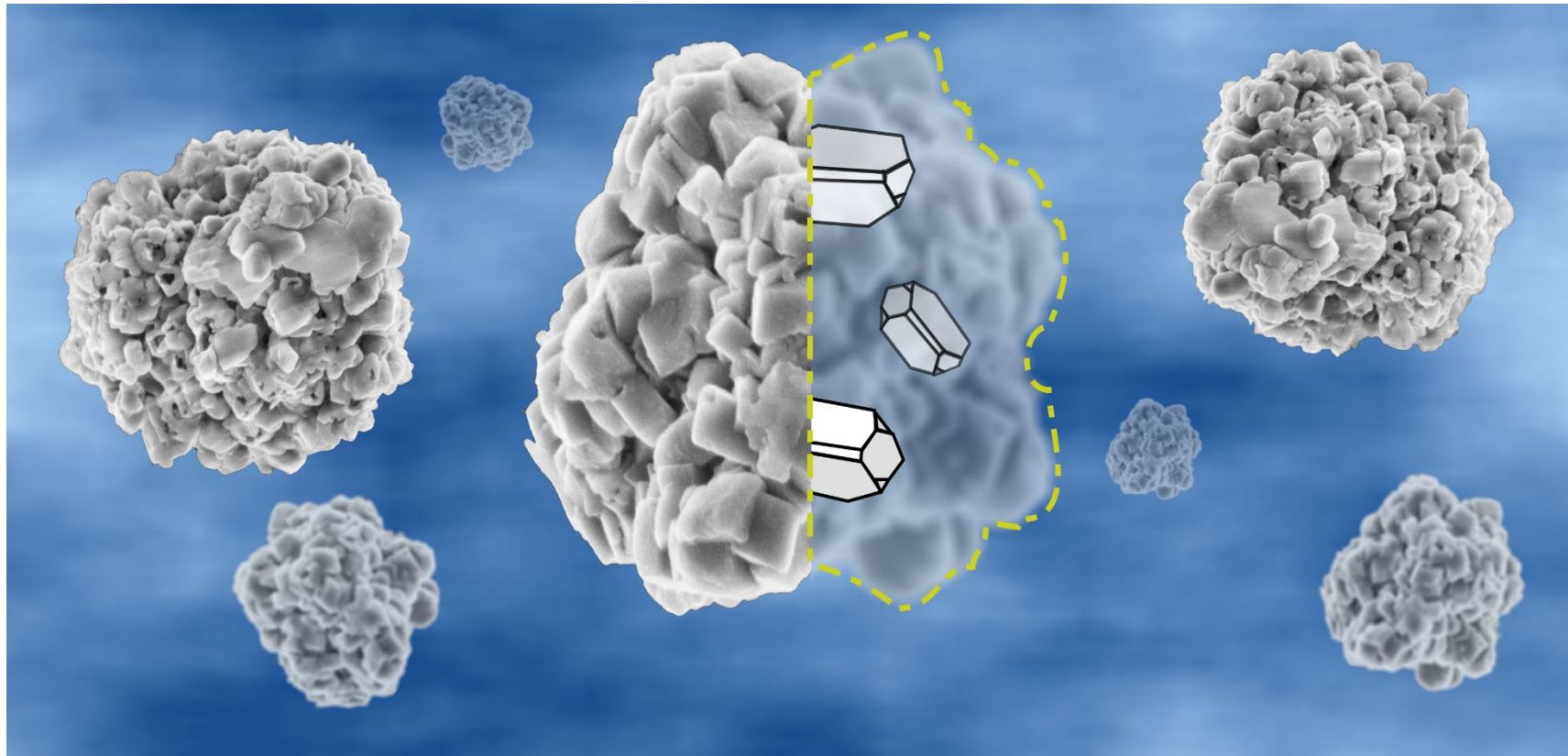
High quality pigments that enable a partial substitution of the titanium dioxide that is used in a wide range of applications.

Reformulate at lower cost with no compromise in opacity, color and overall performance.

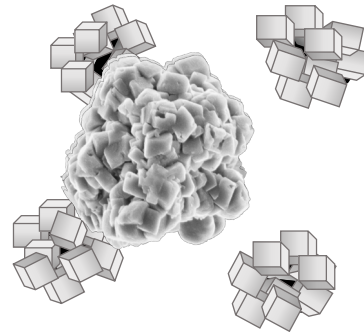
Unique combination of multiple scattering and performance enhancing techniques allows the TiO<sub>2</sub> Composite Pigments to work in conjunction with functional extenders.

Composite pigment products for the coatings, plastics, inks and paper industries

- These composite pigments are designed to provide equivalent optical properties of coatings while maintaining other coating characteristics and requirements at reduced cost.



# Manufacturing of TiO<sub>2</sub> Composite Pigments



3. TiO<sub>2</sub> composite pigment is formed



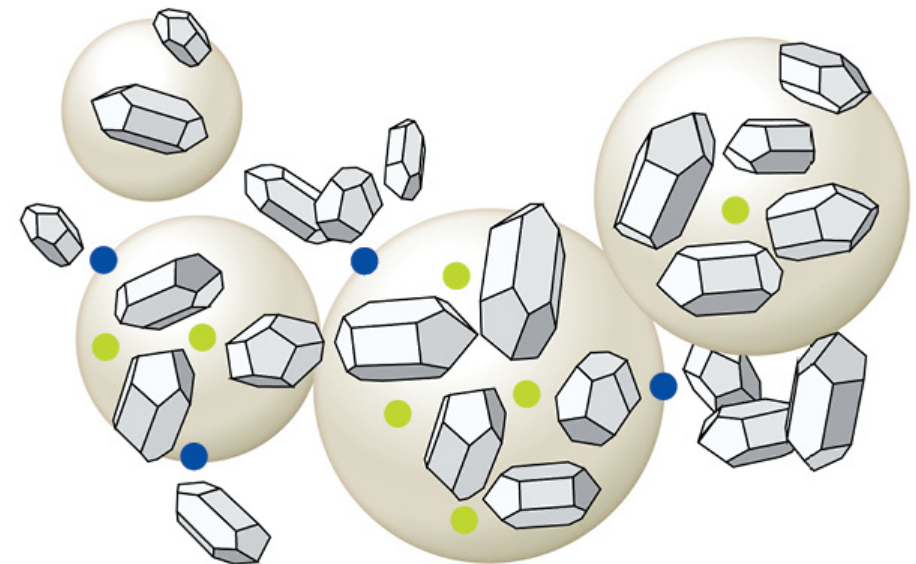
# How Do TiO<sub>2</sub> Composite Pigments Work?

Composite pigments optimize the use of TiO<sub>2</sub> without compromise.

This allows manufacturers to maintain optical and performance properties at a lower cost than TiO<sub>2</sub> alone.

## Optimize hiding power by:

- Having a Refractive Index of 1.9
- Optimally spacing TiO<sub>2</sub> in the FP product
- Spacing loose TiO<sub>2</sub>
- Creating air voids
- Increasing light scattering



● Spacing of TiO<sub>2</sub> particles within the composite

● Spacing of TiO<sub>2</sub> particles within the composite and loose TiO<sub>2</sub>

- TiO<sub>2</sub> Composite Pigments are suitable for:

- Polyester/TGIC formulations
- Polyester/Primid formulations
- Epoxy/Polyester hybrid formulations
- Pure Epoxy formulations
- Acrylic formulations



- At an optimized replacement ratio between 10 - 20%, TiO<sub>2</sub> composite pigments can be used for interior and general purpose exterior powder coatings
- They are also suitable for use in UV cured Powder Coatings where their reduced UV absorption, compared to TiO<sub>2</sub>, can aid coating through-cure

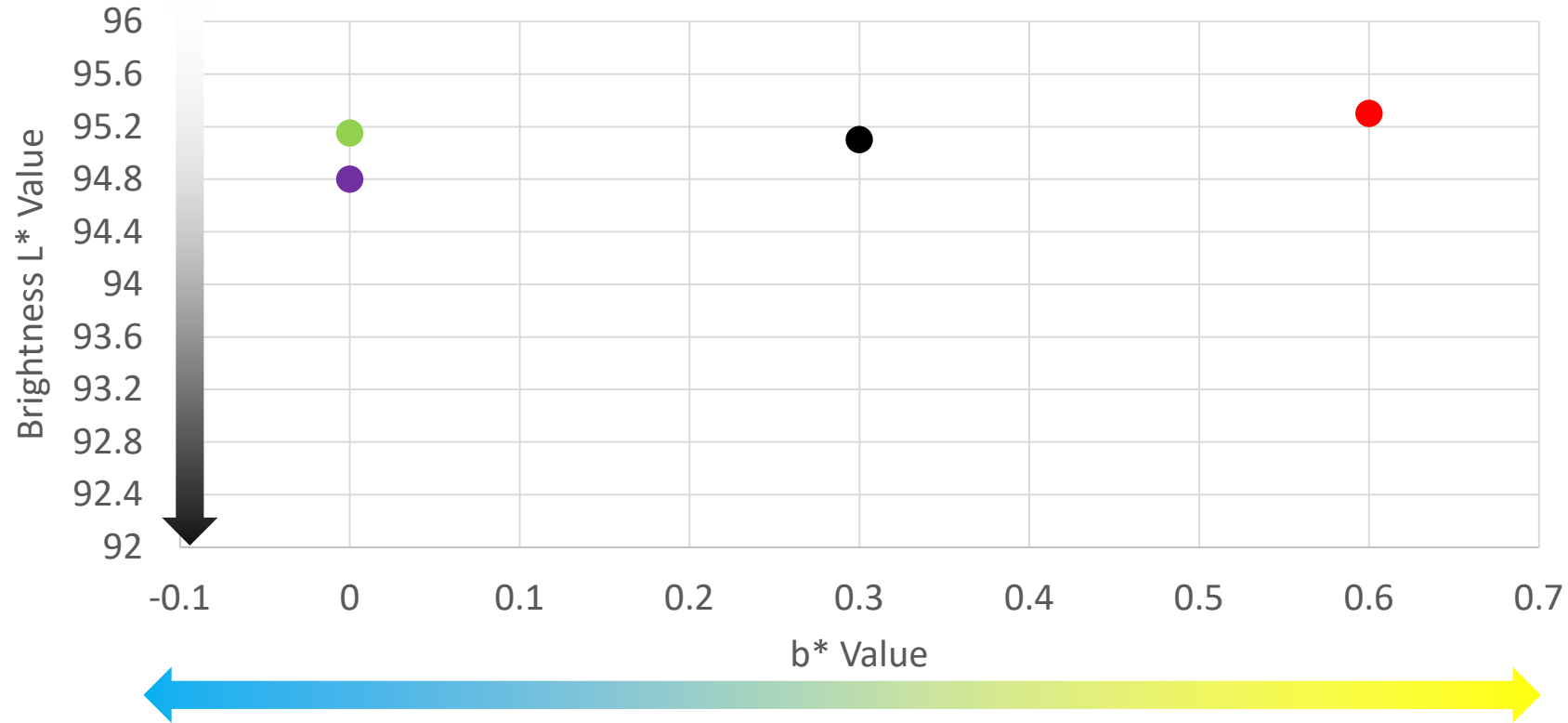
## Formulation and Processing Conditions

Materials	
Polyester Resin	Cytec Crylcoat 2441-2
Crosslinker	Triglycidyl Isocyanurate
Flow Agent	ResiflowP67
Degassing Agent	Benzoin
25% TiO <sub>2</sub>	Kronos 2160
5% BaSO <sub>4</sub>	Sachtleben Blanc Fixe Micro
TiO <sub>2</sub> Composite Pigment	

Processing Conditions
Premix:8 seconds Vitamix at low setting
Extrusion: APV 19mm twin screw extruder
Zone1:130°C
Zone2:100°C
RPM:500
Torque:30-45%
Chill Rolls:20RPM
Grind: Strand Mill
Sieve:140 mesh(106µm)
Film Thickness: As specified
Bake: 10 minutes at 200°C



# Typical Performance - Color

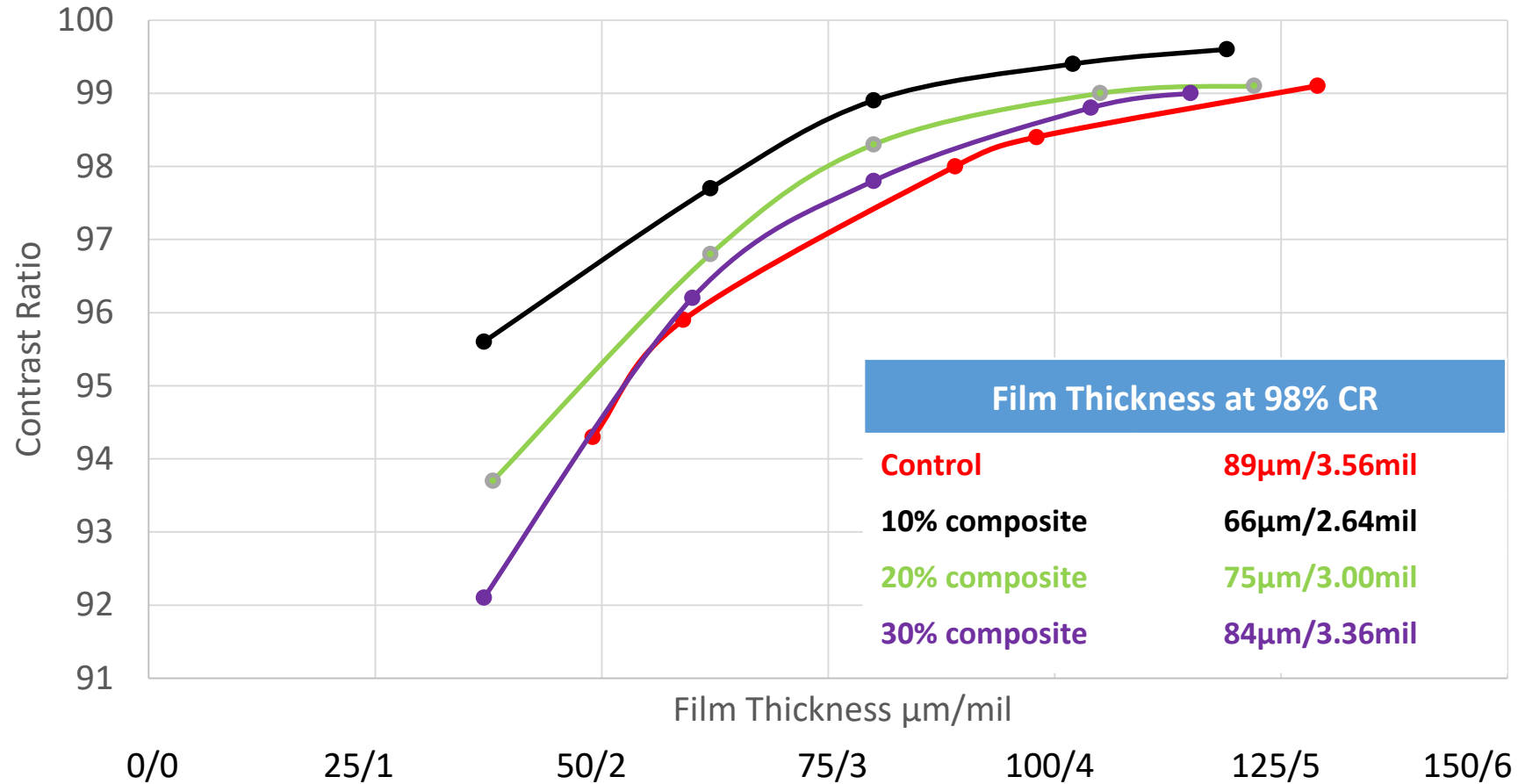


**Standard**  
**10% composite**  
**20% composite**  
**30% composite**

The use of the TiO<sub>2</sub> composite pigment in powder coatings typically produces a bluer mass tone resulting in a bluer, white coating.

# Typical Performance - Opacity

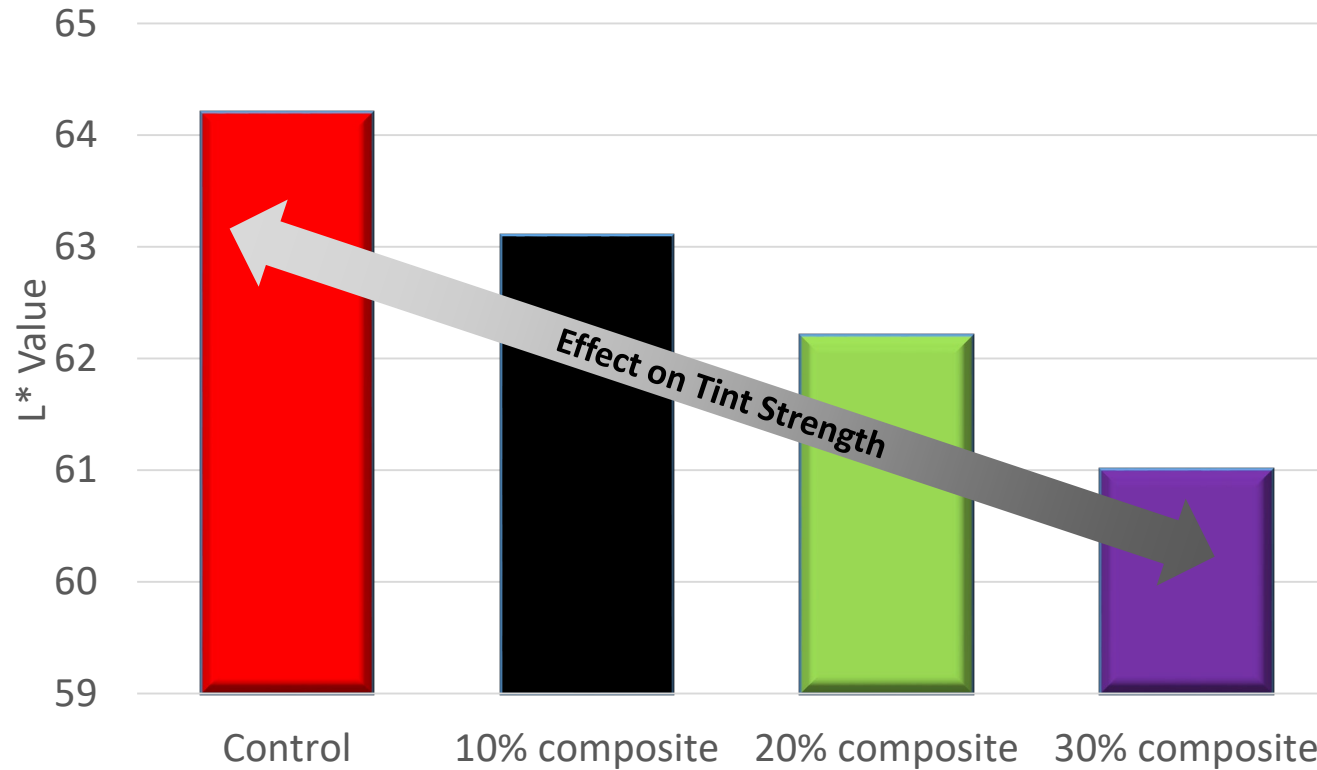
## Contrast Ratio in a Polyester/TGIC Powder Coating



Based on Contrast Ratio, a 30% TiO<sub>2</sub> substitution is possible

# Typical Performance – Tint Strength

Tint Strength in a Gray Polyester/TGIC Powder Coating\*

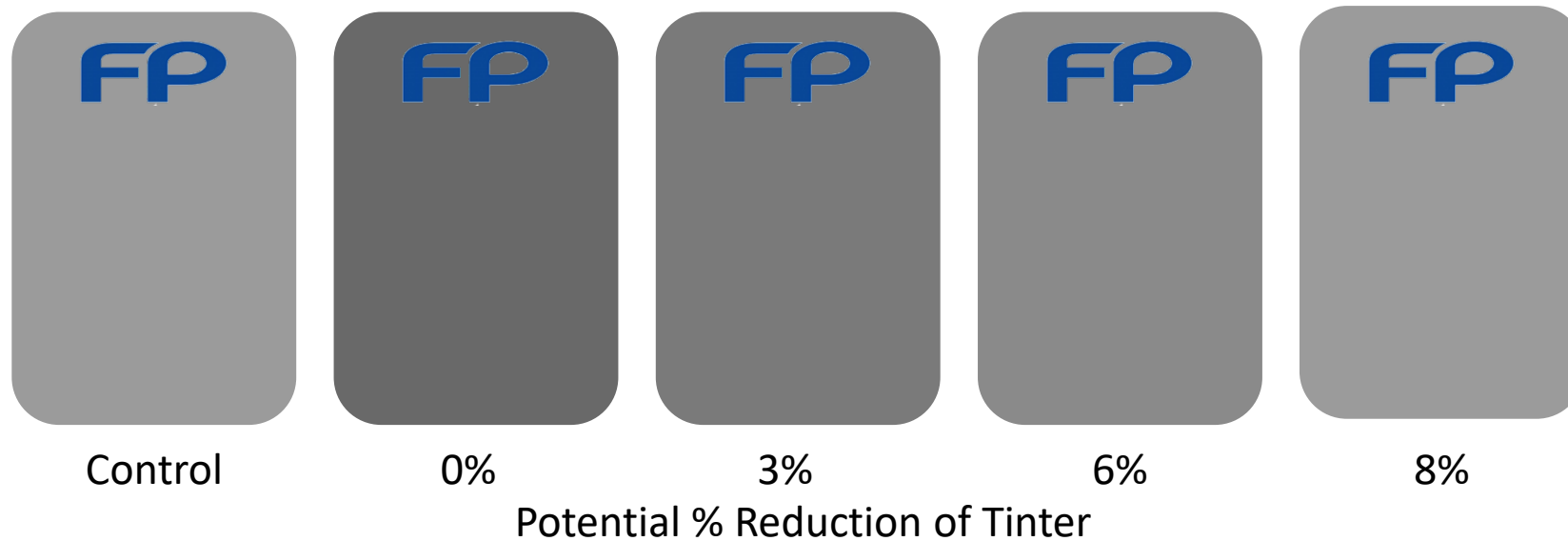


\* Control Tint formulation contains  
24.00% Blanc Fixe  
5.94% Kronos 2160  
0.06% Black Pearls 280

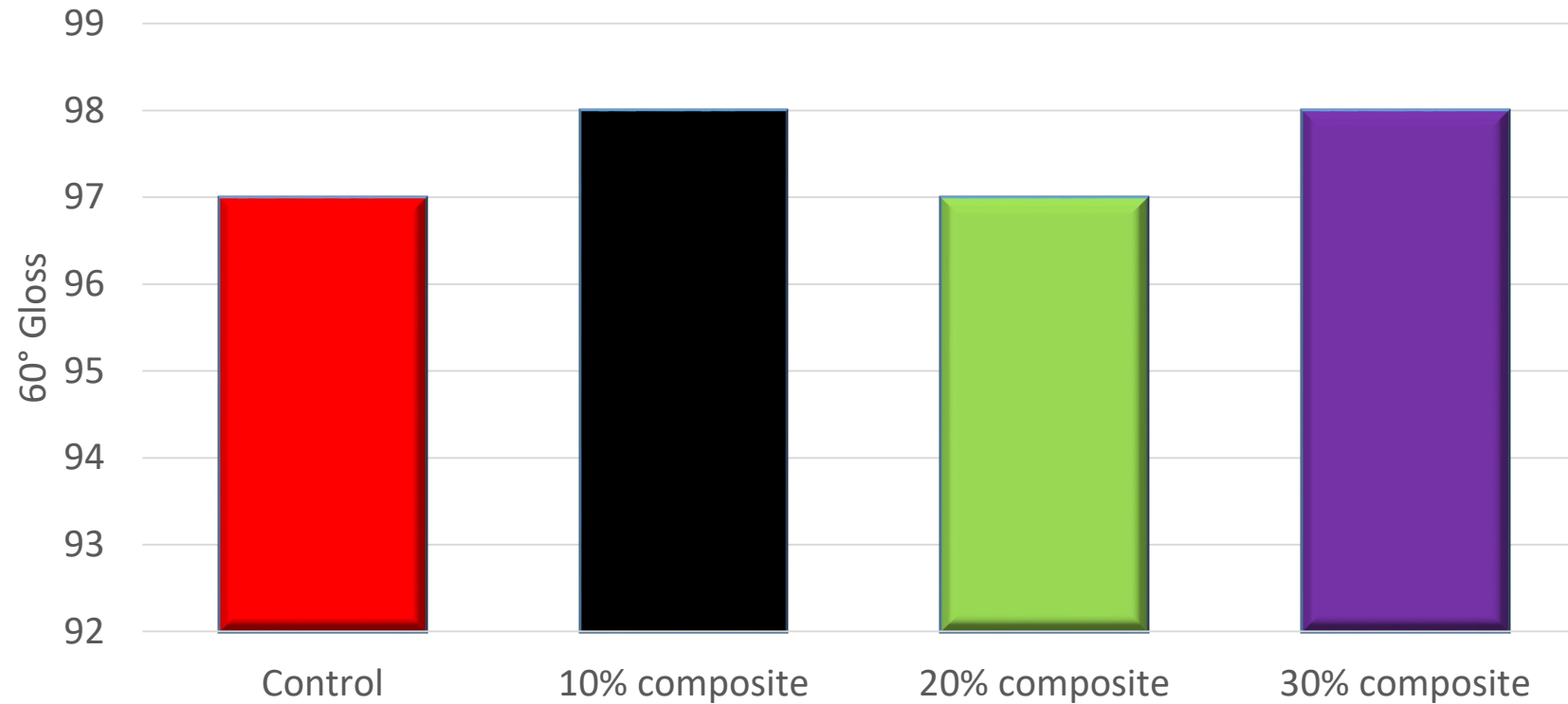
# Potential for Colorant Reduction

- 1) Use of the TiO<sub>2</sub> Composite Pigment lowers the total TiO<sub>2</sub> level.
- 2) This new product will have lower tint strength.
- 3) This can be adjusted by reducing the colorant level.

## 20% TiO<sub>2</sub> Substitution



Gloss (60°) in a Polyester/TGIC Powder Coating

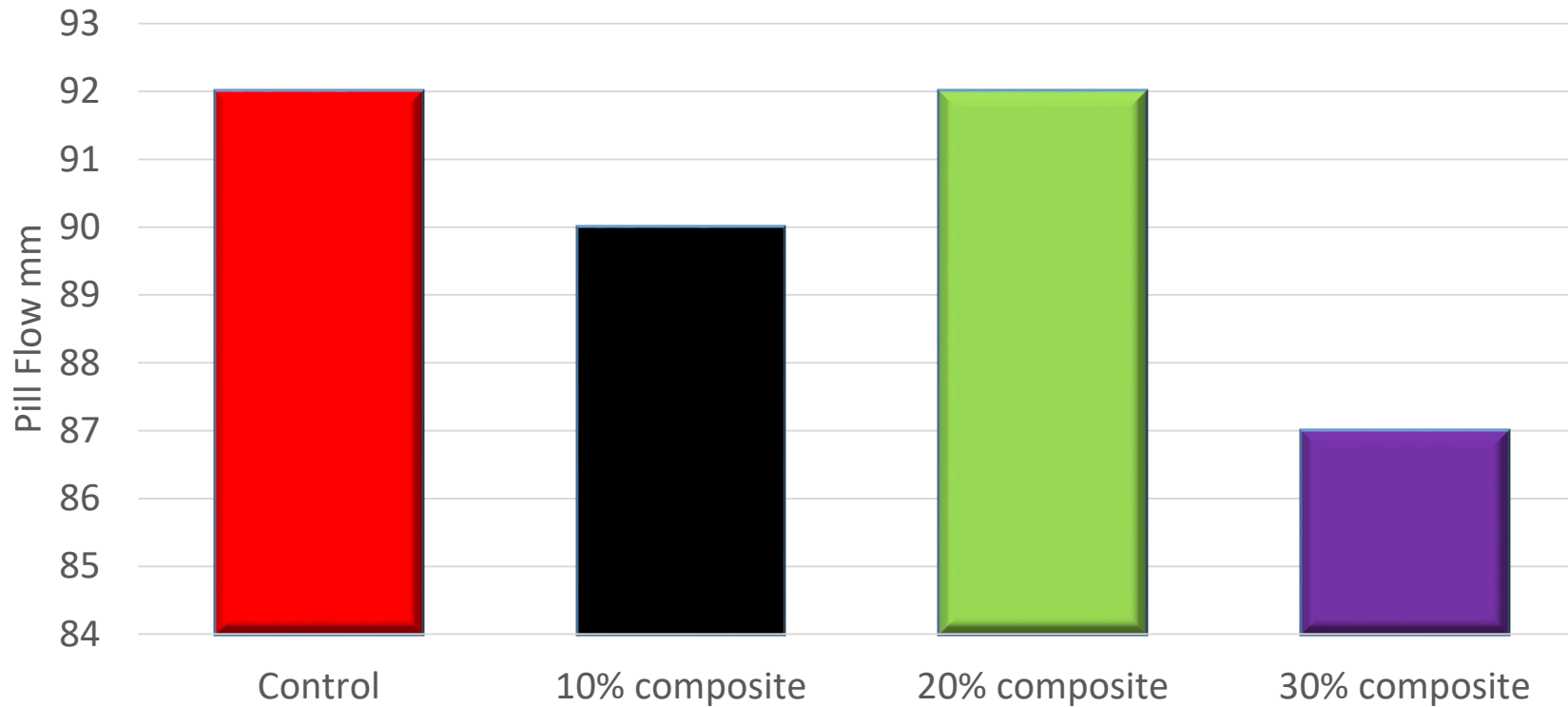


No statistical impact on gloss



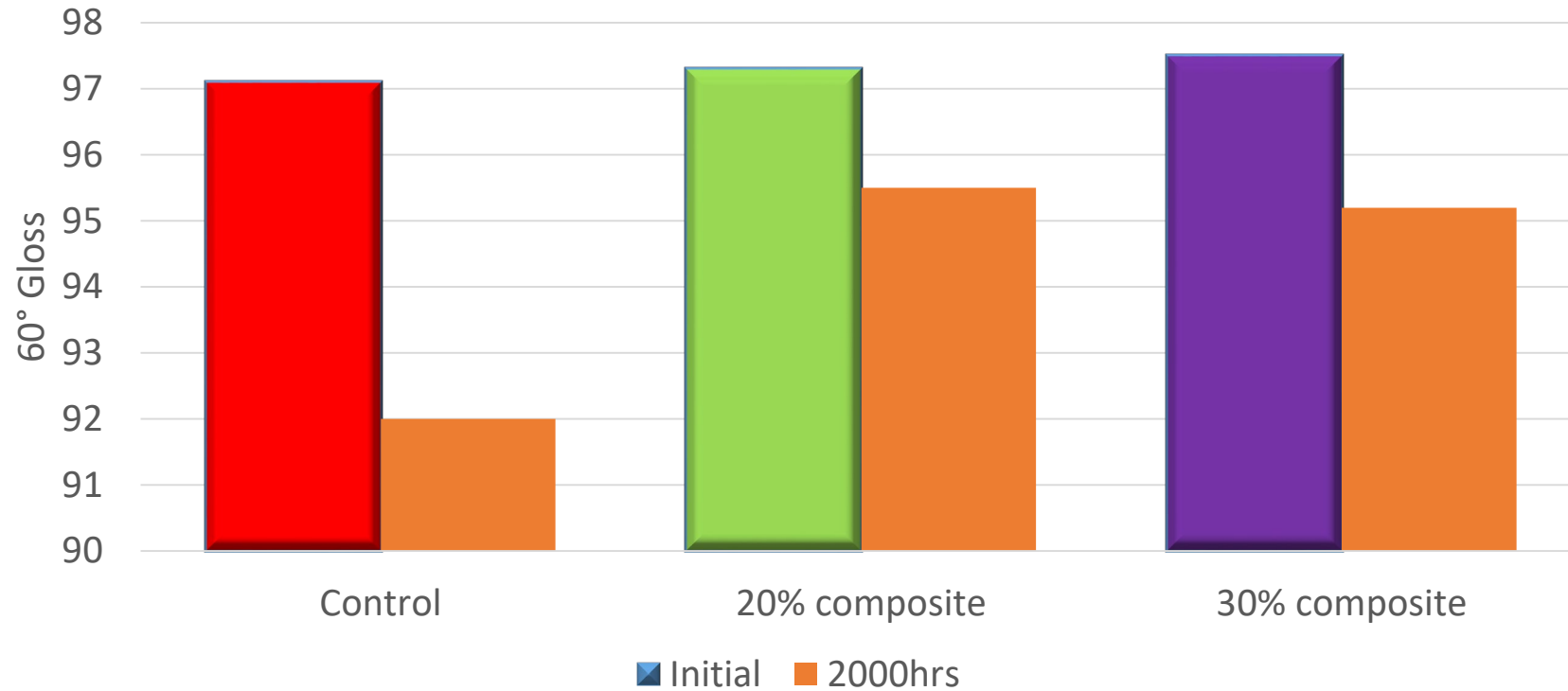
# Typical Performance – Pill Flow

Pill Flow (mm) in a Polyester/TGIC Powder Coating



No major differences in pill flow.

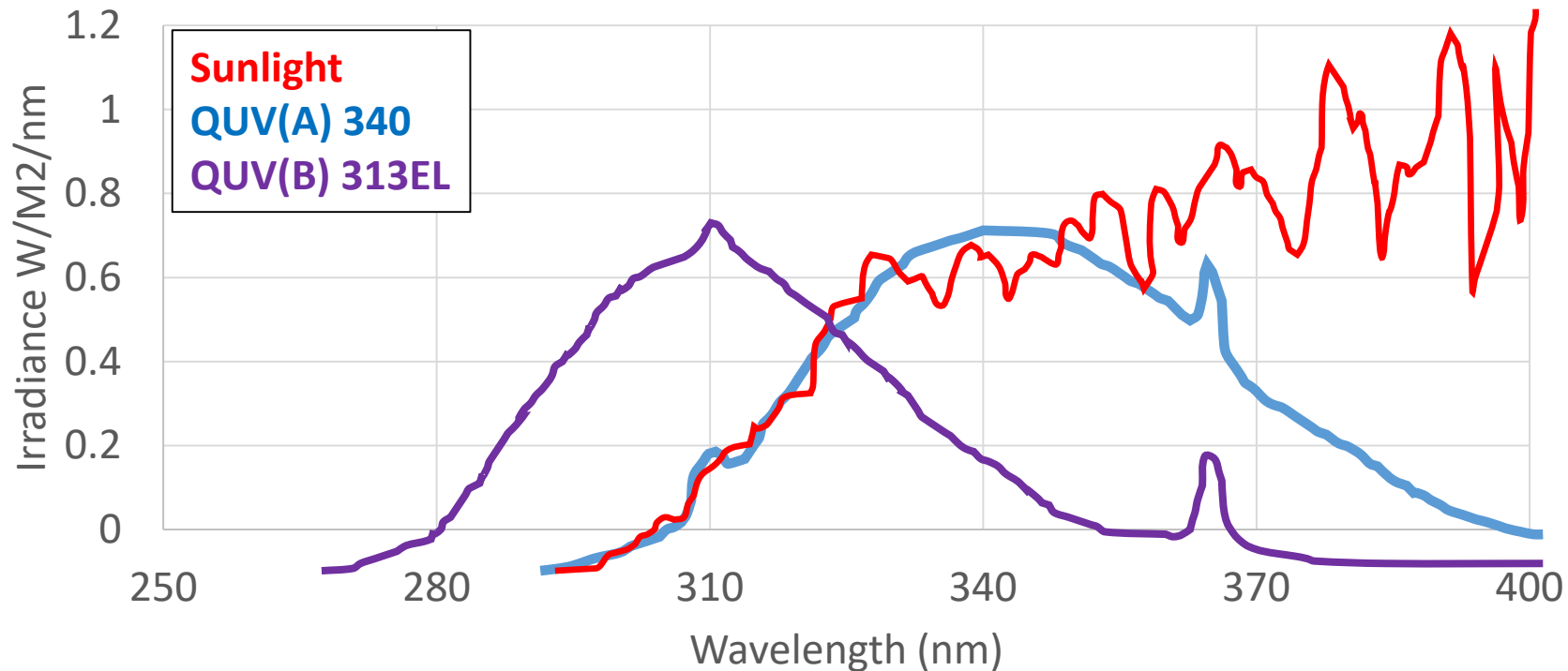
## Gloss Retention in Polyester/TGIC Powder Coating QUV(A)



- 1) QUV(A) accelerated testing shows no significant effect on the exterior gloss performance.
- 2) Testing of composite panels with QUV(B) lamps produces variable results often in contradiction to natural Florida weathering.

# Comparison of QUV A & B lamp Output

## QUV(A) & QUV(B) Lamps Compared to Sunlight



According to Q-Lab\*:

UVA 340 lamps are the best available simulation of sunlight in the critical short-wave UV region and usually provide better correlation with actual outdoor weathering.

UVB lamps produce mostly short-wave UV for maximum acceleration, however because all UVB lamps emit unnatural, short-wavelengths of UV that are below the solar cut-off of 295nm, anomalous results can occur.

- These unique TiO<sub>2</sub> Composite Pigments are used around the world to help reduce TiO<sub>2</sub> consumption and produce high quality, lower cost powder coatings.
- TiO<sub>2</sub> Composite Pigments are ideal for interior and general purpose exterior powder coatings, maintaining product performance with reduced TiO<sub>2</sub> levels.
- Typical replacement levels of 10 - 20% are being used across the powder coatings industry in pure and hybrid formulations.

*Thank You*



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Supporting files

# Coating Measurement

## Improved Measurement Accuracy

Several “methods” exist for the measurement of opacity of powder coatings. The most common method involves the following:

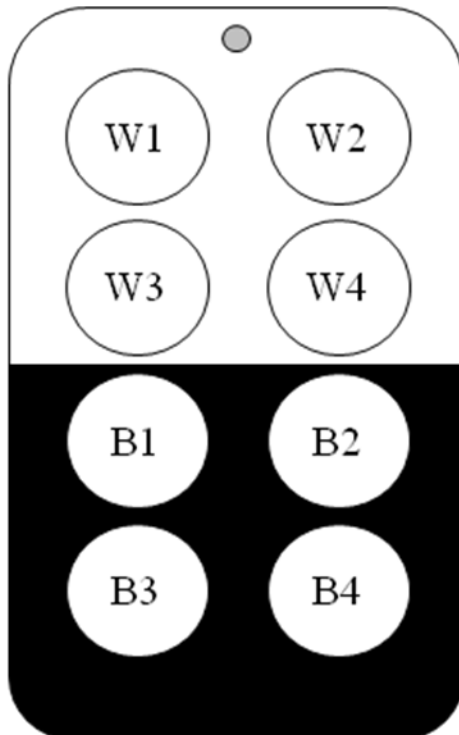
1. spraying of panels to 100 $\mu$ m thickness
2. Coatings applied to bare metal panels
3. measuring the L\* or Y value over one, two or three areas (and averaging)
4. Measuring the film thickness of the panel often over different areas than the opacity measurement(s)

Unlike liquid coatings, powder panels are never evenly coated, the actual film thickness varying depending on the grind and sieve conditions and the experience of the applicator. Films can vary by as much as  $\pm 5\mu$ m (or greater) and this leads to inaccuracies in the opacity measurement of up to  $\pm 1.0$  units for an experienced applicator.

# Coating Measurement

## Improved Measurement Accuracy

To help improve the accuracy of the powder coating measurements, reducing the error from  $\pm 1.0$  down to  $\pm 0.5$ , the following panels and techniques were used.



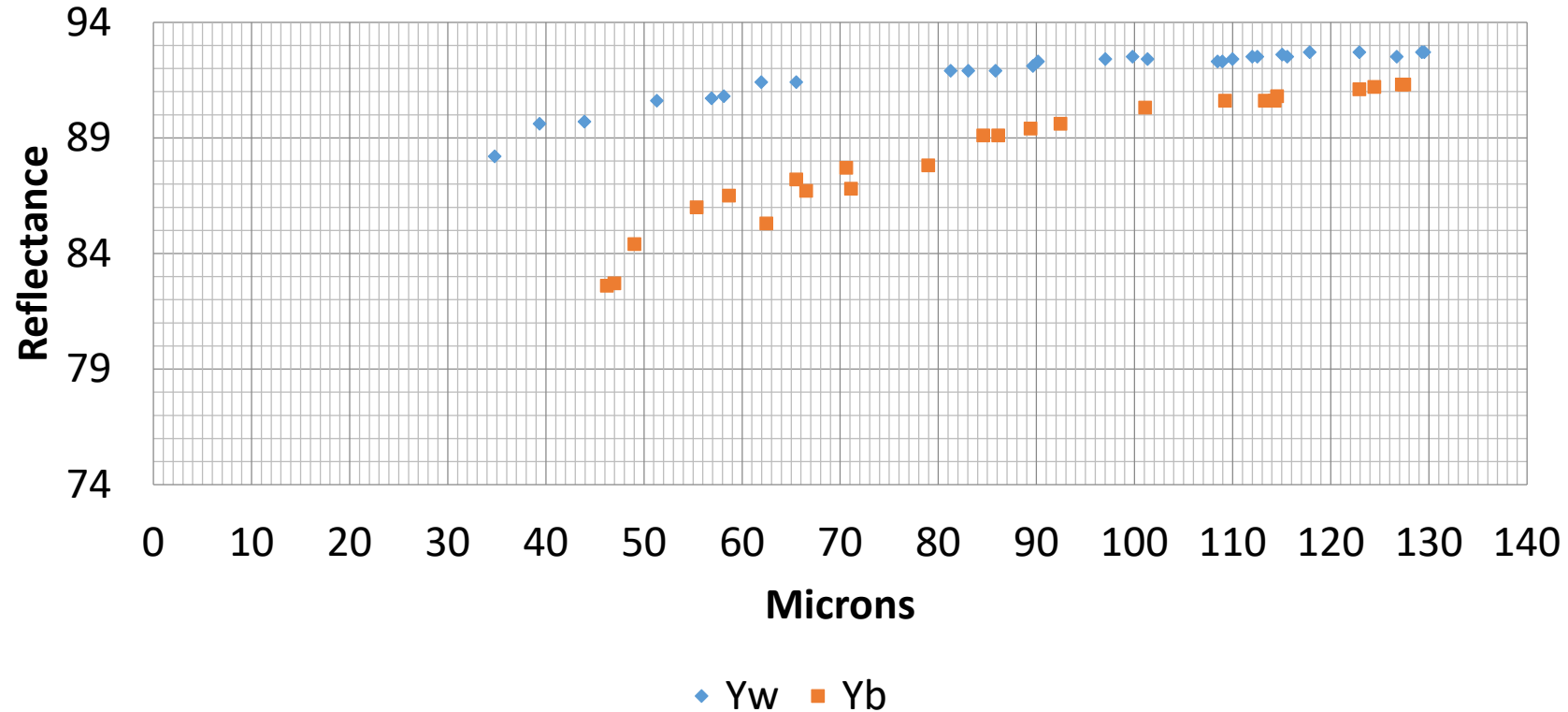
### T12G Metopac™ (Metal) Panel

T12G is a black and white metopac™ (metal) panel with overall dimensions of 3 x 5-3/16 in (76 x 132 mm). Measurement of Film thickness of powder coating should be taken following the template below.

The film thickness should be measured at a minimum of 5 points within each circle and averaged for that area. (The film thickness of the existing white and black coatings should also be measured and deducted from the PC thickness)

Reflectance values should be measured over the same circular area giving eight readings per panel. Each reflectance reading should be associated with the average film thickness for that area.

## FP-480 10% Replacement



The raw data is plotted and “Best Fit” curves drawn. The curves are used to provide data at 40, 50, 60, 75 and 100 $\mu$ m (1.5, 2, 2.5, 3 and 4 mil).