

Carbon black for Powder Coatings

Kris Wright Research Associate, Liquids Lab Kristopher.Wright@adityabirla.com Natalie.Harris@adityabirla.com

Dr. Natalie Harris NA Tech Biz Dev Manager

SHARE THE STRENGTH

Powder Coatings Summit September 8, 2022















FAMILIAR BONDS

COMPOUND **KNOWLEDGE**

MICRO MATTERS

BEYOND DURABLE TESTED

Overview



About Birla Carbon

Carbon Black Use in Powder Coatings

Fundamentals of Carbon Black

Carbon Black Selection and Processing Effect on Performance

Birla Carbon's Solution

Take-aways







Birla Carbon is Part of the Aditya Birla Group



PREMIUM GLOBAL CONGLOMERATE adityabirla.com



Birla Carbon: Long History of Global Presence



BIRLA CARBON has been serving a global customer base for more than 150 years with an annual carbon black production capacity exceeding 2 Million metric tonnes across 100+ unique grades. With a team of more than 2,400 people, BIRLA CARBON operates in 12 countries on 5 continents across 16 different plants - including 2 state-ofthe-art research centres in the US and India.

SHARE THE STRENGTH



Carbon Black in Powder Coatings



- Carbon black is utilized as a primary colorant or tinting agent in powder coatings
- Adds functionality to coatings by way of UV resistance, electrical and thermal conductivity



More Than a Pigment...



- Carbon Black is produced by a thermal decomposition of hydrocarbon feedstock under very limited air supply
- It is composed of multiple near spherical primary particles fused into aggregates
- Morphology is leveraged to enhance performance





Carbon Black Fundamental Properties





Carbon Black Fundamental Properties





How is Performance Derived?







Formulation Considerations



 Thermoset Polyester-TGIC formulation represents one of the most common formulation types globally

Benzoin			1.3%				
L	Leveling Aid		2.0%				
Carbon Black 1.5%							
TGIC					6.0%		
		Bari	um Sulfa	ate		9.2%	
Polyester Resin							80.0%





Trends in Dispersion

- Attractive forces bind aggregates into agglomerates
- Agglomerate strength increases with finer particle size and higher structure
- High energy required to separate agglomerates prior to stabilization

SHARE THE STRENGTH



Medalia, I and Richards, L.W., "Tinting Strength of Carbon Black", JCIS Vol 40 Number 2







Dispersion of Carbon Black

- Thermosetting powder coatings typically utilize twin-screw extrusion to disperse
- Extent of dispersion determined by:
 - Void space occupied by material
 - Extruder temperature
 - Screw speed and design
- Proper product selection reduces
 effects of process limitations









Effects on Full Shade Color

ADITYA BIRLA BIRLA CARBON

- Surface area predominantly dictates color performance
- Higher surface area typically develops deeper blackness and bluer undertone

SHARE THE STRENGTH





Effects on Tinting Strength

- Stronger tinting ability from higher surface area products
- Coarser particles
 lend bluer tone

SHARE THE STRENGTH





Carbon Black Pellet Flow

- Higher surface area and lower structure have higher agglomerate strength
- Tightly bound aggregates are difficult to wet
- Wetting and degree of dispersion influence pellet flow





<u>A</u>



Physical Form and Surface Treatment



- Carbon black
 surface treatment
 lowers melt
 viscosity
- Combination of beading and surface treatment enhance flow properties



<u>M</u>

Effects on Full Shade Color



 Improved flow and compatibility has minimal effect on color

 Attributed to dispersion process





Summary

- Material properties of carbon black influence pigment dispersion, color, and flow
- Higher surface area improves jetness, and tint strength.
- Surface treatment lowers melt viscosity, improving flow
- Key properties can be achieved in powder coatings with non-treated carbon blacks











Thank You

Conductex and Ultra are trademarks owned by Birla Carbon U.S.A., Inc. or its affiliates and are registered in one or more countries. For details, visit birlacarbon.com/privacy.

The information presented within this presentation is based on Birla Carbon's research and the research of others, but neither its accuracy nor completeness is guaranteed. BIRLA CARBON MAKES NO, AND DISCLAIMS ALL, REPRESENTATIONS AND WARRANTIES, EXPRESS OR IMPLIED, REGARDING ACCURACY, PERFORMANCE, STABILITY, RELIABILITY, OR USE, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND OR FITNESS FOR A PARTICULAR PURPOSE. The user is solely responsible for determining the suitability of any product for a specific purpose. No suggestion for use is intended as or should be construed as a recommendation to infringe upon any patent or to violate any law or regulation. Before handling, using, or processing any material, always read its Safety Data Sheet. ©2022 Birla Carbon 05/2022





