BIRLA CARBON

SPECIALTY BLACKS

Raven® and Conductex® Carbon Blacks for Specialty Applications
A carbon black’s application performance is determined by its fundamental properties and the level of dispersion achieved. The most important physical and chemical properties include particle size, porosity, structure, and surface chemistry. The level of dispersion in any given matrix is strongly influenced by the mixing equipment, formulation (including dispersant selection), and physical form.

**Particle Size** is the primary influence on color properties. Particle size is measured by electron microscopy (EM). Mean particle size is certified via statistical thickness surface area (STSA) correlation according to ASTM D3849-14. Smaller particle diameter gives rise to higher surface area and tinting strength. High surface area is usually associated with greater jetness, higher conductivity, improved weatherability, and higher viscosity, but requires increased dispersion energy.

**Structure** is a measure of the three-dimensional fusion of carbon black particles to form aggregates. Highly structured carbon blacks provide higher viscosity, greater electrical conductivity and easier dispersion. Measures of aggregate structure may be obtained from shape distributions from EM analysis, oil absorption (OAN) or void volume analysis.

**Porosity** is indicated by comparing a carbon black’s external surface area predicted by STSA to the total surface area value obtained with the BET NSA method. Conductive carbon blacks tend to have a high degree of porosity.

**Surface Chemistry** of carbon blacks generally refers to the oxygen-containing groups present on a carbon black’s surface. Oxidized surfaces improve pigment wetting, dispersion, rheology, and overall performance in selected systems. In other cases, oxidation increases electrical resistivity and makes carbon blacks more hydrophilic. The extent of surface oxidation is measured by determining the quantity of the “volatile” component on the carbon black. High volatile levels are associated with low pH.

**Physical Form** is important in matching a carbon black to the equipment by which it is to be dispersed. Powdered carbon blacks are recommended in low-shear dispersers and on three-roll mills. Beaded carbon blacks are recommended for shot mills, ball mills and other high energy equipment. Beading provides lower dusting, bulk handling capabilities, and higher bulk densities, while powdered carbon blacks offer improved dispersibility.

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### Additional Properties:
- Other Constituents - Sulfur, Ash, Residue, etc.
- Physical Form - Beads or Powder
SPECIALTY CARBON BLACK APPLICATIONS

Specialty blacks are used in a wide variety of applications including coatings, printing inks, plastics, and sealants. The selection of a specific product for an application depends on the end-use requirements as well as processing conditions.

ULTRA® CARBON BLACKS
Birla Carbon products are high performance pigments targeted for use in demanding applications. Carbon black purity and consistency of performance, always important, are now recognized as being critical to continuing quality improvement. Birla Carbon has developed products that provide the highest level of purity available. These products, referred to as Ultra carbons, serve as industry benchmarks in various application segments. Ultra products benefit various application systems by providing greater uniformity, increased compatibility, improved dispersion, better processing, longer screen life, enhanced color development, and reduced scrap.

COATINGS
Coatings may be formulated with an extremely wide range of products such as Raven 410 for utility finishes, Raven 1255 for various medium color industrial coatings, and Raven 5000 Ultra II for high quality, extremely jet, blue undertone automotive topcoat applications. Specialty blacks primarily used for tinting have low surface areas and broad particle size distributions. Products with these properties provide good economics coupled with a desired blue tone and best resistance to flooding and flocculation. Raven 14 Powder, an easily dispersed post-treated carbon black, is the industry standard for blue undertone and tinting in paints and coatings.

INKS
Specialty blacks for inks are generally medium to coarse in particle size and are used for full color rather than tinting properties. In liquid ink applications such as publication and packaging gravure, the Raven 400 and Raven 500 series products are widely used because of their rheology, ease of dispersion, and blue tone. Raven L Ultra is used when the masstone requirements are higher. Depending on specific requirements, high quality inks are formulated with products such as Raven 760 Ultra, Raven 1000, and Raven 1035.

PLASTICS
Carbon black may be incorporated into thermosets or thermoplastics for color, tint, or functional reasons. Masstone color plastic applications can employ the entire available range of carbon black particle sizes. Selection will depend upon loading, dispersion, and cost. The coarser products are excellent choices in applications where blue tone, tinting strength, and ease of dispersion are preferred. Conductex blacks provide different degrees of electrical conductivity for a wide range of plastics requirements. Conductex 7055 Ultra and Conductex K Ultra offer optimum conductivity with minimal contribution to viscosity in applications such as wire and cable, ESD, as well as conductive coatings. For applications requiring very high jetness such as engineering plastics, Raven 2000, Raven 2350 Ultra, and Raven 2500 Ultra are recommended. For ultraviolet protection, Raven UV Ultra and Raven PFEB are industry standards for jacketing, film, and pipe applications.

 Ultra® is a registered trademark of Columbian Chemicals Co.
### GLOBAL SPECIALTY BLACKS PRODUCT PORTFOLIO

<table>
<thead>
<tr>
<th>Raven® and Conductex® Carbon Blacks</th>
<th>D6556</th>
<th>D2414</th>
<th>D2965</th>
<th>2A-700</th>
<th>Producing Country</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raven 5000 Ultra II</td>
<td>583</td>
<td>350</td>
<td>95</td>
<td>95</td>
<td>135</td>
<td>10.5</td>
</tr>
</tbody>
</table>
| Raven 5000 Ultra 3 | 583 | 350 | 95 | 95 | 135 | 10.5 | U.S. | High jetness plastics; industrial and powder coatings; inkjet ink |}

**Treated products** typically range in pH from 3.0–3.5. **Non-treated products** typically range in pH from 6.5–8.0. **OAN and tint strength** are measured prior to treatment. **Treated products** are used for inkjet inks and **non-treated products** for high-quality inks including heatset, sheetfed, and UV coatings.
THE ONLY SPECIALTY BLACKS SOLUTION YOU NEED, FROM THE WORLD LEADER IN CARBON BLACK. CONTACT US TODAY.
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