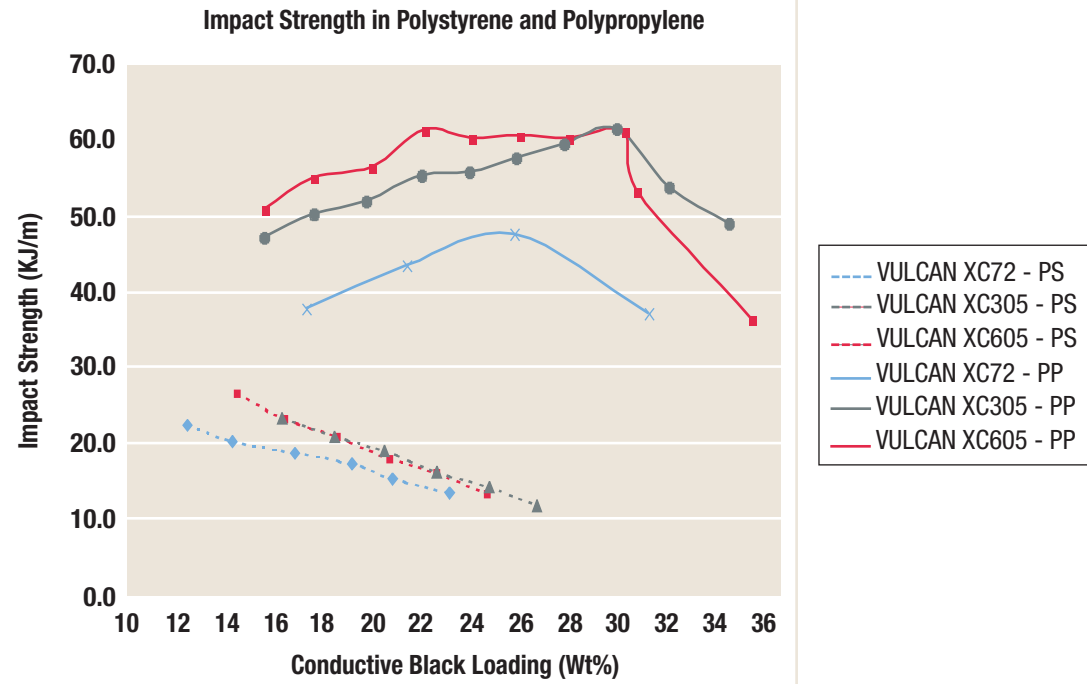


Impact Strength

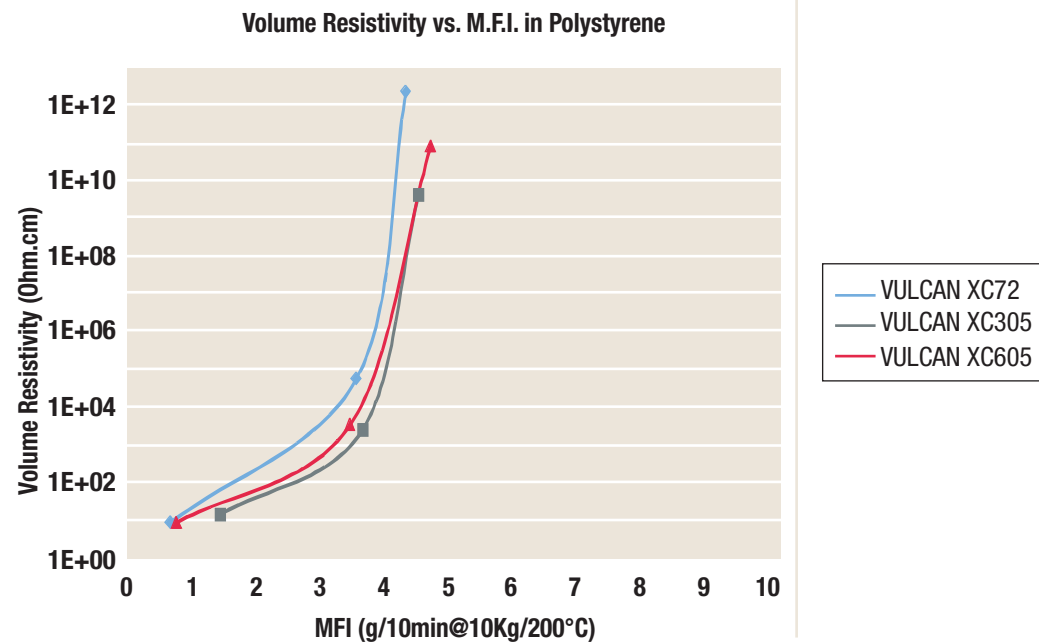
The shape of the impact strength curves vs. conductive black loading is very different for polypropylene and polystyrene. In polypropylene, impact strength increases up to an optimum carbon black loading and then decreases. In polystyrene, the same property decreases constantly as carbon black loading increases.

For both polymers, VULCAN XC605 and VULCAN XC305 present excellent performance, while VULCAN XC72 yields relatively lower impact values, especially in polypropylene.



Volume Resistivity vs. Viscosity

All these specialty blacks provide similar viscosity at the same levels of volume resistivity as shown in the graph.



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CARBON BLACKS



CABOT
creating what matters

VULCAN® XC Conductive Blacks for Premium Performance in Electrostatic Discharge (ESD) Applications



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VULCAN® XC Conductive Blacks for Premium Performance in Electrostatic Discharge (ESD) Applications

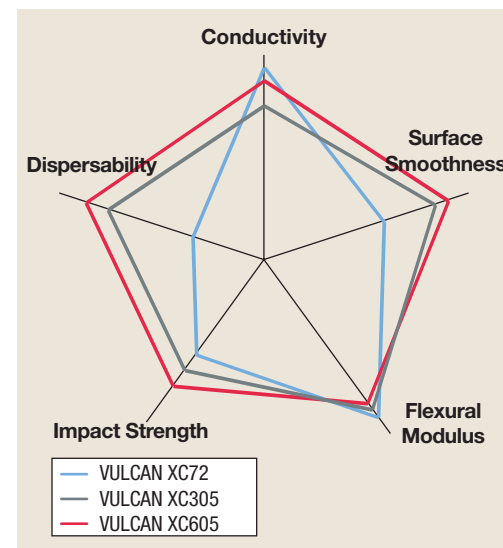
Cabot has developed a full range of specialty conductive blacks. VULCAN® XC72, VULCAN XC605 and VULCAN XC305 are our response to the increasing need for a differentiated product range for ESD applications.

Each of these grades is specifically designed to meet a particular performance balance in terms of the five key performance criteria important to the conductive compound formulators:

- **Conductivity:** surface resistivity (SR) of the conductive compounds at equal conductive black loading
- **Surface Smoothness:** surface defects that appear on an extruded tape under tightly controlled conditions
- **Stiffness (Flexural Modulus):** resistance to deformation of a plastic part when a gradually increasing stress is applied
- **Impact Strength:** total energy a plastic part can absorb before it breaks when a sudden impact stress is applied
- **Dispersability:** ease with which the conductive black can be wetted with the resin and subsequently de-agglomerated.

Star Diagram

A visual and accessible way to compare different conductive blacks on their relative suitability for ESD applications is the star diagram. This star diagram compares the performance of VULCAN XC conductive blacks in terms of five key performance criteria. These performance measures are discussed in more detail in this brochure. In this star diagram, the conductivity performance is compared at equal black loading, while the other performance criteria are compared at equal conductivity levels.



Performance improves from chart centre

Market Segmentation

The ESD market can be segmented as depicted below. Each sub-segment is discrete in its performance requirements vis-à-vis the carbon black and its compound. We demonstrate this schematically in the table for the two key performance requirements: conductivity and dispersability.

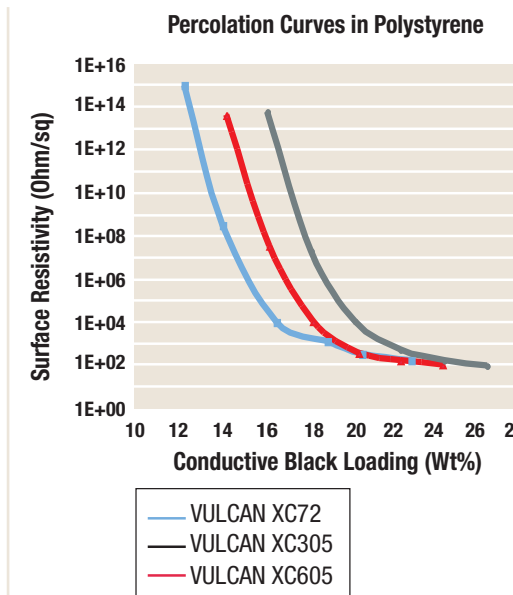
Conductive polymer compositions can be made using conductive blacks such as VULCAN XC 305 or VULCAN XC 605 at the loading levels shown below, which have a volume resistivity greater than 100 Ohm.cm at room temperature*. These conductive polymer compositions are well-suited for use in a variety of applications, including, e.g., various automotive applications. (* See US Patent Nos. 7141624 and 6852790; other patents pending in China, Japan, Europe, Poland and South Korea)

Segment	Sub-segment	Conductivity	Dispersability	Grade fit
Electrical & Electronics	IC carrier tapes	•••••	•••••	VULCAN XC605
	ESD films	•••••	•••••	VULCAN XC605
	IC thermoformed trays	••••	••••	VULCAN XC305, XC605, XC72
	ESD corrugated boards	••••	••••	VULCAN XC305, XC605, XC72
	IC rigid trays	••••	••	VULCAN XC305, XC605, XC72
	ESD boxes	•••	••	VULCAN XC305
Safety	Containers	•••••	••••	VULCAN XC605, XC72
	Fiber/slit tape	••••	•••	VULCAN XC305, XC605, XC72
	Conveying (pipes, etc.)	•••	••	VULCAN XC305, XC605, XC72
Business Machines	•••••••	••	VULCAN XC72	

• = indicates degree of importance of the performance measure

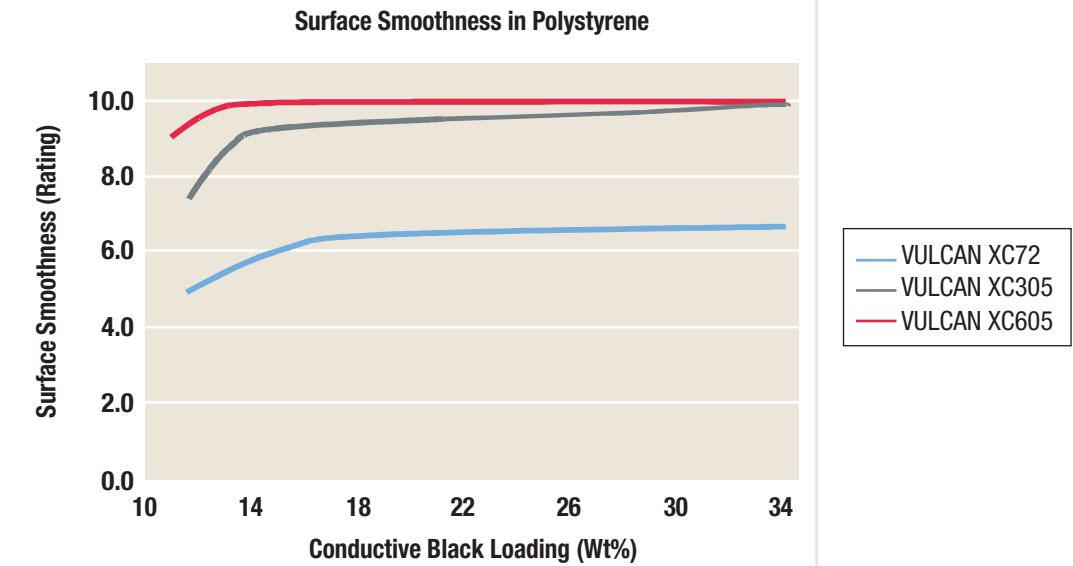
Conductivity

The percolation curves on the right show that, to obtain a given resistivity, the loading of VULCAN XC72 will be lower than the loading of VULCAN XC605, itself lower than the loading of VULCAN XC305. The relative loading differences stay the same when using these specialty blacks in various polymer systems at equivalent conductivity. Nevertheless, we must remember that the choice of a conductive black should be based on the balance of the five key properties described in this brochure, depending on the application.



Surface Smoothness

The surface smoothness that can be reached with VULCAN XC605 is excellent. VULCAN XC305 shows a slightly lower level of surface smoothness, while VULCAN XC72 distinctly presents a lower performance.



Stiffness (Flexural Modulus)

Stiffness is more influenced by the choice of polymer than by the type of conductive black.

For a given polymer, the three conductive blacks under consideration perform in a similar way. The relative stiffness performance of these grades stays similar in various polymer formulations.

