

# DuPont™ Vespel® High Temperature Anti-Static Solutions

## CONDUCTIVE MATERIALS NEEDED FOR ELECTRONICS HANDLING—DUPONT™ VESPEL® SP-202



DuPont™ Vespel® SP-202 contactor pads, rollers, guides, and lift pin components have high reliability and long life in high temperature service.

The science of DuPont™ Vespel® helps jet engines run efficiently; keeps transmissions shifting longer; helps snowmobiles run smoother; keeps tractors working longer; and helps parts endure extreme environments from reactor chambers to deep space.

Vespel® SP-202 conductive polymer is superb as a material solution for high temperature substrate handling applications and provides low life cycle cost via high thermal endurance, low wear, and relative ease of fabrication.

### Challenges

- Preventing tribological static charges from damaging electronic components during manufacture and handling in high temperature environments.
- High-end conductive plastics are too brittle, extremely expensive to fabricate, and degrade quickly from heat aging.
- Other advanced engineering plastics do not have the thermal properties to take the heat.
- Positioning tolerances are critical. High wear rates lead to contamination and poor positioning.
- Metals and ceramics are too hard and abrasive and they can damage the components being handled.

### Solutions

#### *Handling components made from DuPont™ Vespel® SP-202*

Vespel® SP-202 has the combination of capabilities that meet these demanding applications.

- Electrostatic charge removal. Vespel® SP-202 is a conductive plastic grade with surface and volume resistivity values in the range of  $10^{-1}$  to  $10^1$  (ohm, ohm-cm).
- Vespel® SP-202 has the thermal resistance to maintain tolerances in high heat applications and through multiple thermal cycles.
- Lower wear rates on contact surfaces generate longer part life and cleaner environments.
- Vespel® SP-202 can be machined to tight tolerances with relative ease.

### Material Performance Comparison

	Metals	Ceramics	Other High Performance Conductive Plastics	Vespel® SP-202
Removal of Electric Charge	✓	✓	✓	✓
Short-term Temperature Resistance	✓	✓	✓	✓
Long-term Thermal Endurance	✓	✓	X	✓
Low Component Wear	✓	X	X	✓
Low Substrate Damage	X	X	✓	✓
Ease of Fabrication	✓	X	X	✓

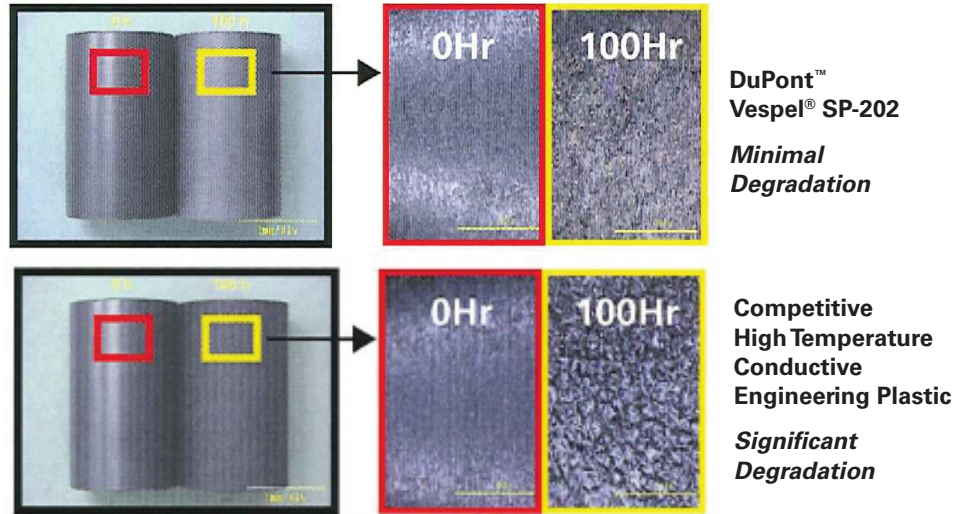


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## Benefits

- Although material cost is higher than some engineering plastics, lower scrap rates and machining cost may yield offsetting savings during the fabrication process.
- Low wear rates will provide consistent positioning and long part life resulting in high production utility and low maintenance cost.
- Low particle generation will keep operating environments clean.
- Properly grounded components will not hold a charge preventing the attraction of dust and other charged particles.

**Before and After Heat Aging Tests Results: 350°C in Nitrogen.  
Samples Were Dried for 4 Hours at 120°C.**



## Typical Properties of DuPont™ Vespel® SP-202 Plaque

Property	Test Method	Units	Value		
			Perpendicular	Parallel	
<b>Thermal</b>					
CLTE, 35–300°C (95–572°F)	ASTM E 831	E-6/C (E-6F)	28 (16)	86 (47)	
<b>Electrical</b>					
Surface Resistivity	ASTM D 991	ohm	1E1	1E-1	
Volume Resistivity	ASTM D 991	ohm-cm	1E-1	1E1	
<b>Other</b>					
Specific Gravity	ASTM D792		1.49	1.49	
Hardness, Rockwell, Scale E	ASTM D 785		66	51	
Water Absorption, Immersion, 24 hr	ASTM D 570	%	0.23	0.23	
<b>Mechanical</b>					
Tensile Strength at Break	ASTM D 638	MPa (kpsi)	23°C (73°F)	92 (13.3)	56 (8.1)
			260°C (500°F)	53 (7.7)	28 (4.1)
Elongation at Break	ASTM D 638	%	23°C (73°F)	4.5	2.6
			260°C (500°F)	5.2	2.6
Tensile Modulus	ASTM D 638	MPa (kpsi)	23°C (73°F)	3,700 (530)	2,800 (402)
			260°C (500°F)	2,600 (378)	1,800 (256)
Flexural Modulus	ASTM D 790	MPa (kpsi)	23°C (73°F)	6,300 (911)	6,500 (947)
			260°C (500°F)	4,600 (671)	4,600 (674)
Flexural Strength	ASTM D 790	MPa (kpsi)	23°C (73°F)	159 (23)	164 (24)
			260°C (500°F)	89 (13)	91 (13)
Compressive Strength	ASTM D 695	MPa (kpsi)	23°C (73°F)	206 (29.9)	230 (33.4)
			260°C (500°F)	105 (15.2)	114 (16.5)
Compressive Strain at Break	ASTM D 695	%	23°C (73°F)	30	26
			260°C (500°F)	27	21

Vespel® SP-202 parts are conductive (<10E2 ohm) for quick elimination of static charges. They show excellent wear resistance, dimensional stability at even 450°C, and good machinability.

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**Caution:** Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

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