PLASTICYL™ PA1501
Polyamide 66 – carbon nanotubes masterbatches

General Information

Description
PLASTICYL™ is a family of multiwall carbon nanotubes (MWCNTs) thermoplastic concentrates for applications requiring superior electrical conductivity and electrostatic discharge (ESD) properties.

PLASTICYL™ PA1501 is a conductive masterbatch based on polyamide 66 loaded with 15% of Nanocyl’s MWCNTs (NC7000™). Because of its high flow, PLASTICYL™ PA1501 is ideal for injection molding and extrusion processes.

Key Applications
- Electrostatic Discharge (ESD) and electrically conductive parts
- Electrical and Electronics (E&E) and industrial
- Injection molding, extrusion
- Automotive fuel line parts and connectors
- E-painting

Benefits
- Excellent electrical conductivity at low loading
- Retention of key mechanical properties
- Ease of processing
- Meets SAE J1645 automotive standards
Technical Data

Main Characteristics

<table>
<thead>
<tr>
<th>CARBON NANOTUBES LOADING (% WT)</th>
<th>REAL DENSITY (G/L)</th>
<th>MVR (cm³/10 MIN)</th>
<th>MELTING POINT (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 ± 1,0</td>
<td>1149</td>
<td>21</td>
<td>252</td>
</tr>
</tbody>
</table>

Typical Performance after Injection Molding

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>STANDARD</th>
<th>UNITS</th>
<th>NEAT POLYAMIDE 66</th>
<th>DILUTION TO 2% WT OF CNT</th>
<th>DILUTION TO 4% WT OF CNT</th>
<th>DILUTION TO 6% WT OF CNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume resistivity</td>
<td>ASTM D4496</td>
<td>Ohm.cm</td>
<td>&gt; 1,00.10¹²</td>
<td>7,43.10²</td>
<td>3,80.10³</td>
<td>7,54</td>
</tr>
<tr>
<td>Surface resistivity</td>
<td>IEC 167</td>
<td>Ohm/sq</td>
<td>&gt; 1,00.10¹²</td>
<td>&gt; 1,00.10¹²</td>
<td>6,82.10⁴</td>
<td>3,01.10⁴</td>
</tr>
<tr>
<td>Young’s Modulus</td>
<td>ISO 527-1,2</td>
<td>MPa</td>
<td>2910</td>
<td>2915</td>
<td>2982</td>
<td>3061</td>
</tr>
<tr>
<td>Tensile strength at break</td>
<td>ISO 527-1,2</td>
<td>MPa</td>
<td>59</td>
<td>61</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Strain at break</td>
<td>ISO 527-1,2</td>
<td>%</td>
<td>37</td>
<td>-</td>
<td>2,6</td>
<td>2,2</td>
</tr>
<tr>
<td>Charpy notched impact strength</td>
<td>ISO 180</td>
<td>kJ/m²</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Melt flow - MVR (270°C; 5 kg; 2 mm)</td>
<td>ISO 1133:1997</td>
<td>cm³/10 min</td>
<td>172</td>
<td>96</td>
<td>37</td>
<td>10</td>
</tr>
<tr>
<td>Color</td>
<td>-</td>
<td>-</td>
<td>White</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
</tr>
</tbody>
</table>

Compounds were processed using an L/D ratio and a 48 twin-screw extruder under proprietary conditions. Specimens were molded by injection, according to the processing parameters below.

In order to get well-dispersed CNT aggregates, Nanocyl recommends the use of polymers with a high Melt Flow Index (MFI). Surface Resistivity results can be significantly influenced by molding/extrusion conditions.
### General Processing Guidelines for Injection Molding

<table>
<thead>
<tr>
<th>INJECTION SPEED</th>
<th>MOLD TEMPERATURE</th>
<th>MATERIAL TEMPERATURE</th>
<th>PLASTICIZING SPEED</th>
<th>BACK PRESSURE</th>
<th>HOLDING PRESSURE</th>
<th>HOLDING TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm(^3)/s</td>
<td>°C</td>
<td>°C</td>
<td>m/s</td>
<td>bars</td>
<td>bars</td>
<td>s</td>
</tr>
<tr>
<td>50</td>
<td>70</td>
<td>300</td>
<td>0.2</td>
<td>40</td>
<td>650</td>
<td>10</td>
</tr>
</tbody>
</table>

**Percolation Curve for Volume Resistivity**

![Percolation Curve for Volume Resistivity](image1)

Electrical resistivity measurement in accordance with Nanocyl standard method based on standard injection molded IZOD specimens, processed according to parameters provided before (General Processing Guide for Injection Molding).

**Percolation Curve for Surface Resistivity**

![Percolation Curve for Surface Resistivity](image2)

Electrical resistivity measurement in accordance with Nanocyl standard method based on standard injection molded IZOD specimens, processed according to parameters provided before (General Processing Guide for Injection Molding).
Commercial/Safety Information

Packaging
PLASTICYL™ PA1501 masterbatches (pellets) are available in different packaging:
- 20 kg sealed white plastic bags,
- 600 kg cardboard octabins.

Minimum Order of Quantity
Nanocyl's minimum order of quantity for PLASTICYL™ PA1501 is 20 kg.

Custom Grades
Besides the commercial grades, Nanocyl is able to toll-compound any type of polyamide 66 masterbatches to meet its clients’ needs.

Health and Safety
A Material Safety Data Sheets (MSDS) is available to provide both workers and emergency personnel with the proper procedures for handling or working with the PLASTICYL™ PA1501. This MSDS includes information such as physical data (form and color, melting point, etc.), handling and storage recommendations, first aid measures and ecological information. The Safety Data Sheet is provided with any order and should be observed.

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