COMPARISON OF COUPLING AGENTS EFFICIENCY IN GLASS FIBER REINFORCED POLYPROPYLENE

INTRODUCTION

By using the coupling agent: PP, grafted with maleic anhydride, we can improve mechanical properties of composites with PP + short-chopped glass fibers.

In this report we compared tensile properties, Charpy impact strength and Fogging buildup of GRAFTABOND™ PPH-MAH 70025 CAF and Scona TSPP 10213 GB.

MATERIALS USED

<table>
<thead>
<tr>
<th>PP matrix:</th>
<th>Resinex 2004 RXP PP Homopolymer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass fibers:</td>
<td>ThermoFlow 636</td>
</tr>
<tr>
<td>Coupling agents:</td>
<td>SCONA TSPP 10213 GB</td>
</tr>
<tr>
<td></td>
<td>GRAFTABOND™ PPH-MAH 70025 CAF</td>
</tr>
</tbody>
</table>

The two mixtures were prepared in the following wt. %:

<table>
<thead>
<tr>
<th>Matrix PP</th>
<th>69%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Fibers</td>
<td>30%</td>
</tr>
<tr>
<td>Coupling Agent</td>
<td>1%</td>
</tr>
</tbody>
</table>

SAMPLE TESTING AND PREPARATION

Samples were prepared and tested (Pictures from left to right):

- Twin screw extrusion of PP with GF
- Injection molding of specimen for mechanical tests -
  (all mechanical tests were performed 1 week after injection molding)
- Tensile test (ISO 527)
- Charpy Impact Test (ISO 179)
- Fogging Test (ISO 6452)
Material Report

RESULTS

Mechanical Test Results

Tensile tests were done in A1 specimen, with testing speed of 50 mm/min. Charpy Impact Strength was done on 1eU specimen (Unnotched).

<table>
<thead>
<tr>
<th>Coupling agent used</th>
<th>Max. Tensile stress [MPa]</th>
<th>Elongation at Break [%]</th>
<th>Charpy Impact Strength [kJ/m^2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Coupling Agent</td>
<td>58</td>
<td>3.5</td>
<td>19.3</td>
</tr>
<tr>
<td>SCONA TSPP 10213 GB</td>
<td>105</td>
<td>4.7</td>
<td>42.1</td>
</tr>
<tr>
<td>GRAFTABOND™ PPH-MAH 70025 CAF</td>
<td>112</td>
<td>5.2</td>
<td>46.6</td>
</tr>
</tbody>
</table>

Coupling Agent Comparison

- Charpy Impact Strength [kJ/m²]
- Elongation at Break [%]
- Max. Tensile Stress [MPa]
Material Report

**Fogging Test Results**

Fogging test was done at 100°C for 12 h, on 1 g of the prepared PP-GF30 compound.

<table>
<thead>
<tr>
<th>Coupling agent used</th>
<th>Fog Deposit [mg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scona TSPP 10213 GB</td>
<td>16.2</td>
</tr>
<tr>
<td>GRAFTABOND™ PPH-MAH 70025 CAF</td>
<td>0.2</td>
</tr>
</tbody>
</table>

What is fogging?

The additives contained in the materials used as automotive interior materials volatilize in the inside of a car when the temperature rises and condense onto the internal surfaces of the window panes that have been cooled by outside air. As a result, the front glass and window panes are clouded, disturbing a field of view. This phenomenon is called “fogging”, and the fogging properties of the materials are reproduced and evaluated.

**CONCLUSIONS**

- When using coupling agents, tensile properties and Charpy impact strength all increase considerably.
- GRAFTABOND™ PPH-MAH 70025 CAF has slightly better mechanical properties than Scona TSPP 10213 GB.
- The fogging buildup of Scona TSPP 10213 GB is significantly higher, which leads to clouded glass surfaces in automotive interior.
- GRAFTABOND™ PPH-MAH 70025 CAF offers the best color and properties together, and it is made in a one-step process with extrusion only. (granules can be provided with underwater pelletizing)
CONTACTS

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