DENKA IP

Heat Resistance Modifier for ABS
(DENKA IP + ABS = High Heat ABS)

DENKA IP
(≒200°C)

ABS
(≒100°C)
Additives etc

Twin Screw Extruder

High Heat ABS
(≒110 - 150°C)

DENKA

ABS Supplier

Molders

Version 1
2011/March/4th
DENKA IP ~ INTRODUCTION ~

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Denka IP is a “Styrene-N-Phenylmaleimide Copolymer” developed by Denka’s unique polymerization technology in the early 1980s.
1. High Heat Resistance  (Tg = 196°C)
2. Excellent Heat Stability  (dose not decompose at 350°C)

=>Hence, DENKA IP is suitable for **Heat-Resistance Modifier for ABS**
You need to prepare the followings to make H.H. ABS with DENKA IP

1. DENKA IP
2. ABS Resin (or, Graft-Powder ABS and AS Resin)
3. Antioxidants
4. Twin-Screw Extruder
5. Others if you needed to give an extra function on H.H. ABS (ex. Colorants, Heat-Stabilizer, etc)
Superiority of H.H. ABS with DENKA IP

<Background Information>

- There are two methods of producing High Heat ABS. Traditional method is to use $\alpha$-Methly-Styrene as a resource of heat resistance (i.e. $\alpha$-Methly-Type High Heat ABS), while the later-developed-methodology is to utilize Phenyl Maleimide (i.e. Maleimide-Type High Heat ABS).
- With DENKA IP, you are to make this “Maleimide-Type High Heat ABS.”

<“High Heat ABS with DENKA IP” is superior to traditional “$\alpha$-Methly-Type High Heat ABS”>

~ Why do customers prefer our quality ~

A. Superior Heat-Resistance
B. Superior Thermal Stability
C. Well-Balanced Physical Properties
Maleimide is more efficient than α-methylstyrene for increasing heat resistance.

IP-based H.H.ABS can achieve higher heat resistance than α-methylstyrene-based H.H. ABS.

*Maximum Vicat Softening Temperature of High Heat ABS*

<table>
<thead>
<tr>
<th>Type</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP-based</td>
<td>150°C</td>
</tr>
<tr>
<td>α-methylstyrene-based</td>
<td>120°C</td>
</tr>
</tbody>
</table>
IP-based H.H. ABS has higher thermal stability than α-methylstyrene-based H.H. ABS.

=> Less amount of gas generated during the molding

=> “Easy-Injection (i.e. lower risk of Burned Mark)” “Less Amount of Molds Cleaning”
and “Longer Life Span of Molds”
Superiority of H.H. ABS with DENKA IP
~ C. Well-Balanced Physical Properties~

Example: Comparison between "IP-based H.H. ABS" and "α-methylstyrene-based H.H. ABS"

<table>
<thead>
<tr>
<th></th>
<th>α -MSt-Based</th>
<th>IP-Based</th>
<th>α -MSt-Based</th>
<th>IP-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vicat Softening Temperature</td>
<td>°C</td>
<td>107</td>
<td>107</td>
<td>114</td>
</tr>
<tr>
<td>MFR (220°C, 10KG)</td>
<td>g/10min</td>
<td>5</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Charpy Impact Strength</td>
<td>kJ/m²</td>
<td>22</td>
<td>22</td>
<td>12</td>
</tr>
</tbody>
</table>

With the same heat-resistance level, IP-based H.H.ABS can achieve higher "MFR" and "Charpy Impact Strength" than α-methylstyrene-based H.H. ABS.
# Denka IP Grades Suitable for High Heat ABS Compounding Application

<table>
<thead>
<tr>
<th>Grades</th>
<th>NS–NB</th>
<th>MS–NI</th>
<th>MS–NIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Standard (Powder)</td>
<td>Easy–Compounds (Powder)</td>
<td>Easy–Compounds (Pellet)</td>
</tr>
<tr>
<td>Density</td>
<td>ASTM D792</td>
<td>1.18</td>
<td>1.18</td>
</tr>
<tr>
<td>Tg (Temperature of Glass Transition)</td>
<td>°C</td>
<td>DSC</td>
<td>196</td>
</tr>
<tr>
<td>Temperature of Heating–Loss for 1% Weight</td>
<td>°C</td>
<td>TGA</td>
<td>350</td>
</tr>
<tr>
<td>MFR (265°C, 10kg)</td>
<td>g/10 min</td>
<td>ASTM D1238</td>
<td>3</td>
</tr>
</tbody>
</table>

- MS-NI&MS-NIP have better compound-ability with ABS, in comparison to MS-NB. It would help you to achieve Higher Discharge Rate = Higher Productivity.
General Application of H.H. ABS

- **Automobile Exterior Parts** (e.g. Front Grill, Side Mirror Housing, Spoiler, Rear-Garnish, Wheel Cover, etc)

- **Automobile Interior Parts** (e.g. Car Audio Panel, Heat Control Panel, Power Window, etc)

- **Home Appliances** (e.g. Rice Cooker Lid, Microwave Oven Front Panel, Cellular Phone Housing, Coffee Pot, Hair Dryer, Portable Devices for In-Car Usage, etc)
Thank You