Description
HexPly® M47 is a 135°C curing toughened epoxy matrix, self-extinguishing (depending on standard used) that has been developed for the high performance car market. The matrix exhibits good strength retention at elevated temperature, good process ability and good surface finish. Its Tg allows HexPly® M47 to be considered as an alternative to 180°C curing matrices when a high loaded part in hot environment (80°C) is required.

Benefits and Features
- Good toughened epoxy
- Tg : 135°C
- Good strength retention at high temperatures (80°C)
- Good surface finish
- Long shelf life and out life at room temperature
- Good tack and drape

Resin Matrix Properties

**Rheology (EN 604 3-A, 2°C/min)**

**Gel time (hot plate)**

- Colour: Transparent
- Density: 1.24 g/cm³
- Glass Transition Temperature after 90min at 135°C, TG onset dry: 135°C
Alternative Cure Cycles
The nominal cure is 90 minutes at 135°C, 1 to 7 bar pressure and heat up rate from 1 to 3°C/minute but alternative cure cycles can be used:

<table>
<thead>
<tr>
<th>Cure Temperature</th>
<th>120°C</th>
<th>120°C</th>
<th>135°C</th>
<th>140°C</th>
<th>140°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>60 min</td>
<td>90 min</td>
<td>90 min</td>
<td>60 min</td>
<td>90 min</td>
</tr>
<tr>
<td>Tg onset dry</td>
<td>Up to 135°C*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Depending of the reinforcement

Curing at temperature above 140°C does not further increase the glass transition temperature.

Curing Conditions

Typical cure cycle

Heat-up rates are dependent on component thickness, eg, slow heat-up rates should be used for thicker components and large tools. Accurate temperature measurements of the component should be made during the cure cycles by using thermocouples. For a honeycomb sandwich panel, a cure cycle of 1 to 3 bar should be used, dependent on honeycomb density.

Performance testing should accompany alternative cure cycles to ensure suitability for the particular application.
**Prepreg Physical Properties** (Examples only. For the wider prepreg range contact Hexcel)

<table>
<thead>
<tr>
<th>Product Designation</th>
<th>M47/38%/ UD150/ T700</th>
<th>M47/47%/ 200T2x2/ AS4-3K</th>
<th>M47/42%/ 370T2/ CHS-12K</th>
<th>M47/42%/ 375S5/ AS4-6K</th>
<th>M47/38%/ 660T2x2/ T700-12K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre</td>
<td>HS Carbon</td>
<td>HS Carbon</td>
<td>HS Carbon</td>
<td>HS Carbon</td>
<td>HS Carbon</td>
</tr>
<tr>
<td>Tow</td>
<td>12K</td>
<td>3K</td>
<td>12K</td>
<td>6K</td>
<td>12K</td>
</tr>
<tr>
<td>Weave</td>
<td>UD tape</td>
<td>Twill 2x2</td>
<td>Twill 2x2</td>
<td>Satin 5</td>
<td>Twill 2x2</td>
</tr>
<tr>
<td>Mass (g/m²)</td>
<td>150</td>
<td>200</td>
<td>370</td>
<td>375</td>
<td>660</td>
</tr>
<tr>
<td>Nominal Cured Ply Thickness (mm)</td>
<td>0.158</td>
<td>0.255</td>
<td>0.424</td>
<td>0.430</td>
<td>0.693</td>
</tr>
<tr>
<td>Nominal Fibre Volume (%)</td>
<td>52.9</td>
<td>44.0</td>
<td>49.0</td>
<td>49.0</td>
<td>52.9</td>
</tr>
<tr>
<td>Nominal Laminate Density (g/cm³)</td>
<td>1.54</td>
<td>1.47</td>
<td>1.51</td>
<td>1.50</td>
<td>1.54</td>
</tr>
</tbody>
</table>

**Cured Prepreg Mechanical Properties** (Examples only. For the wider prepreg range contact Hexcel)

Mechanical Properties are based on 135°C cure for 90 minutes, at 7 bar pressure and -0.9 bar vacuum.

Data is the result from several tests on autoclave cured laminates. Some of the values achieved will have been higher, and some lower than the figure quoted. These are nominal values.

<table>
<thead>
<tr>
<th>Test</th>
<th>Methods</th>
<th>Units</th>
<th>M47/38%/ UD150/ T700</th>
<th>M47/47%/ 200T2x2/ AS4-3K</th>
<th>M47/42%/ 370T2/ CHS-12K</th>
<th>M47/42%/ 375S5/ AS4-6K</th>
<th>M47/38%/ 660T2x2/ T700-12K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>EN2561</td>
<td>MPa</td>
<td>2750</td>
<td>930</td>
<td>1100</td>
<td>790</td>
<td>900</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td></td>
<td>GPa</td>
<td>140</td>
<td>69</td>
<td>66</td>
<td>64</td>
<td>61</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>EN 2562</td>
<td>MPa</td>
<td>1580</td>
<td>950</td>
<td>900</td>
<td>850</td>
<td>810</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td></td>
<td>GPa</td>
<td>117</td>
<td>56</td>
<td>53</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>ILSS</td>
<td>EN 2563</td>
<td>MPa</td>
<td>83</td>
<td>63</td>
<td>48</td>
<td>60</td>
<td>48</td>
</tr>
<tr>
<td>Comp. Strength</td>
<td>EN 2850 B</td>
<td>MPa</td>
<td>1450</td>
<td>830</td>
<td>800</td>
<td>710</td>
<td>530</td>
</tr>
</tbody>
</table>

*NB: Data normalised to Fibre Volume Content (55% for fabrics; 60% for UD) except for ILSS and Flexural.*
Prepreg Storage Life
Shelf Life¹: 12 months at -18°C/0°F (from date of manufacture).
¹ Shelf Life: The maximum storage life for HexPly® prepreg, when stored continuously, in a sealed moisture-proof bag, at -18°C/0°F or 5°C/41°F. To accurately establish the exact expiry date, consult the box label.

Out Life²: 30 days at room temperature (25°C max).
² The maximum accumulated time allowed at room temperature between removal from the freezer and cure.

Tack Life³: Up to 30 days (depending of the reinforcements and the resin content) at room temperature (25°C max).
³ Tack Life: The time, at room temperature, during which prepreg retains enough tack for easy component lay-up.

Storage Conditions
HexPly® M47 prepregs should be stored as received in a cool dry place or in a refrigerator. After removal from refrigerator storage, prepreg should be allowed to reach room temperature before opening the polythene bag, thus preventing condensation (a full reel in its packaging can take up to 48 hours).

Precautions for Use
The usual precautions when handling uncured synthetic resins and fibrous materials should be observed. A Safety Data Sheet is available for this product. The use of clean, disposable, inert gloves provides protection for the operator and avoids contamination of material and components.

For more information
Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax® multiaxial reinforcements
- HexPly® prepregs
- HexMC®-i molding compounds
- HexFlow® RTM resins
- HexBond™ adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products
- Polyspeed® laminates & pultruded profiles
- HexAM® additive manufacturing

For U.S. quotes, orders and product information call toll-free 1-800-688-7734. For other worldwide sales office telephone numbers and a full address list, please go to:

https://www.hexcel.com/contact

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