Starting Formulation

SF 8004
Prepreg Matrix for High-Temperature Composites
EPON™ Resin SU-3 and SU-8

Introduction
This epoxy binder system is designed for prepreg tape, sheet, or chopped roving stock utilizing graphite, boron or glass fiber reinforcement for applications requiring long term performance at temperatures as high as 350 °F. Composites fabricated by vacuum bag techniques and cured at a maximum temperature of 350 °F exhibit high interlaminar shear strength and flexural strength when tested at 350 °F.

Formula

<table>
<thead>
<tr>
<th>Material</th>
<th>Supplier</th>
<th>Pounds</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPON Resin SU-3</td>
<td>Hexion</td>
<td>75.0</td>
<td>7.58</td>
</tr>
<tr>
<td>EPON Resin SU-8</td>
<td>Hexion</td>
<td>25.0</td>
<td>2.53</td>
</tr>
<tr>
<td>4, 4’-Diaminodiphenylsulfone</td>
<td>Miller-Stephenson Chemical Co.</td>
<td>32.8</td>
<td>2.95</td>
</tr>
<tr>
<td>Acetone</td>
<td>Shell Chemical Co.</td>
<td>25.0</td>
<td>3.79</td>
</tr>
<tr>
<td><strong>Total Formulation</strong></td>
<td></td>
<td>157.8</td>
<td>16.85</td>
</tr>
</tbody>
</table>

Blending and Impregnation
Melt blend the EPON Resin SU-8 and the EPON Resin SU-3 by heating with agitation. Add the diaminodiphenylsulfone curing agent and heat to 260 °F with moderate agitation. Hold temperature at 260-270 °F until a clear, homogeneous solution is obtained. Add acetone while cooling, to thin to a viscosity suitable for rapid wetting and impregnation of fiber reinforcements at room temperature. Heating of guide rollers and squeeze rollers facilitates maximum impregnation.

"B" - Staging
The impregnated fiber may be "B"-staged to a tacky, drapable consistency by heating for a period of approximately 3 minutes in a forced draft oven or drying tower at a temperature of 200 °F. Prepreg tape and sheet stock should be sandwiched between release film for storage. The tack retention life of the prepreg should be approximately 8 days when stored at 77 °F. A longer or higher temperature "B"-stage operation will yield a dry prepreg suitable for chopped roving molding compounds.

Curing Conditions
The cure conditions listed below were employed to cure a 15 ply, unidirectional graphite composite fabricated from Morganite II fiber:

- Contact Period : None
- Platen Temperature : 275 °F
- Pressure : Pressed to 1/8” Stops
- Time in Press : 2 Hours
- Post Cure : 6 Hours at 350 °F

Properties of Graphite Composite

Properties obtained from a 15 ply Morganite II composite prepared in this manner

Composite described above are contained in Table 1.

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### Table 1 / Properties of Compression Molded Morganite II Bars

<table>
<thead>
<tr>
<th>Property</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber Content, % by volume</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Void Content, % by volume</td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 77 °F</td>
<td>psi²</td>
<td>164</td>
</tr>
<tr>
<td>at 350 °F</td>
<td>psi²</td>
<td>103</td>
</tr>
<tr>
<td>Short Beam Shear Strength</td>
<td>psi³</td>
<td></td>
</tr>
<tr>
<td>at 77 °F</td>
<td>psi³</td>
<td>11,900</td>
</tr>
<tr>
<td>at 350 °F</td>
<td>psi³</td>
<td>6,700</td>
</tr>
</tbody>
</table>

#### Flammability Rating
- Self-Extinguishing

1. 15 ply undirectional composite prepared from heat treated Morganite II Tow.
2. Tested using 16:1 span to depth ratio.
3. Tested using 5:1 span to depth ratio. All specimens failed in tension rather than shear.
4. Tested according to ASTM D-635.

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**General Information**

These are starting formulations and are not proven in the user’s particular application but are simply meant to demonstrate the efficacy of the products and to assist in the development of the user’s own formulation. It is the user’s responsibility to fully-test and qualify the formulation, along with the ingredients, methods, applications or equipment identified herein ("Information"), by the user’s knowledgeable formulator or scientist, and to determine the appropriate use conditions and legal restrictions, prior to use of any Information.

**Safety, Storage & Handling**

Please refer to the MSDS for the most current Safety and Handling information.

Exposure to these materials should be minimized and avoided, if feasible, through the observance of proper precautions, use of appropriate engineering controls and proper personal protective clothing and equipment, and adherence to proper handling procedures. None of these materials should be used, stored, or transported until the handling precautions and recommendations as stated in the Material Safety Data Sheet (MSDS) for these and all other products being used are understood by all persons who will work with them. Questions and requests for information on Hexion Inc. ("Hexion") products should be directed to your Hexion sales representative, or the nearest Hexion sales office. Information and MSDSs on non-Hexion products should be obtained from the respective manufacturer.

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