Starting Formulation

SF 4022 One-Package Adhesive 828 Dicyandiamide One-Package Adhesive

EPON™ Resin 828 / Dicyandiamide

Introduction
This is a simple one-package epoxy adhesive especially suited for metal – metal bonding which will yield a shelf life of at least 6 months at 25°C.

Suggested Uses
- Cost sensitive applications where a one-component adhesive is desired and the substrate to be bonded are capable of withstanding the high temperature cure conditions.

Features
- One Pack
- Economical
- Service temperature up to 150°C

Formula

<table>
<thead>
<tr>
<th>Material</th>
<th>Supplier</th>
<th>phr</th>
<th>Pounds</th>
<th>Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPON Resin 828</td>
<td>Hexion</td>
<td>100</td>
<td>76.9</td>
<td>7.92</td>
</tr>
<tr>
<td>Alumina T-60/T-64 (ground tabular alumina)</td>
<td>Alcoa World Chemicals</td>
<td>20</td>
<td>15.4</td>
<td>0.52</td>
</tr>
<tr>
<td>Cab-O-Sil TS-720 (fumed silica)</td>
<td>Cabot Corporation</td>
<td>10</td>
<td>7.7</td>
<td>0.51</td>
</tr>
<tr>
<td>Total A</td>
<td></td>
<td>130</td>
<td>100.0</td>
<td>8.95</td>
</tr>
<tr>
<td>Part B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyhard 100SF (micronized)</td>
<td>Degussa Corp. – Fine Chemicals Div</td>
<td>6</td>
<td>4.6</td>
<td>0.39</td>
</tr>
<tr>
<td>Total B</td>
<td></td>
<td>136</td>
<td>104.6</td>
<td>9.34</td>
</tr>
<tr>
<td>Total Part A &amp; B</td>
<td></td>
<td>266</td>
<td>204.6</td>
<td>18.29</td>
</tr>
</tbody>
</table>

Mixing Instructions
Evenly disperse all components in the EPON Resin 828, and then pass the compound over a three-roll paint mill for two cycles. Alternatively, a high speed mixer (such as Cowles) can be used; however, care should be taken to keep temperature as low as possible. Temperature should be kept below 45°C (115°F).

This formulation is a basic starting point and can be modified with other filler types, such as talc, clay, alumina, ground silica, wollastonite, or calcium carbonate.

Typical Handling

Table 1 / Handling Properties

<table>
<thead>
<tr>
<th>Properties</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
</table>

© and ™ Licensed trademarks of Hexion Inc.

DISCLAIMER

The information provided herein was believed by Hexion Inc. ("Hexion") to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by Hexion are subject to Hexion’s terms and conditions of sale. Hexion MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion’s specifications. Nothing contained herein constitutes an offer for the sale of any product.
Expected Shelf Life @ 25°C (77°F) = 6 months
Form / Viscosity @ 25°C = Thixotropic Paste
Density @ 25°C = 13.4 lb/gal

Application
All surfaces to be bonded should be clean and free of dust, dirt, grease, oil or other contaminants. For optimum adhesion it is recommended to roughen bonding surfaces. This can be accomplished with abrasive media appropriate for the materials being bonded (such as medium grit emery paper, abrasive disks, grit blasting, wire brushes, etc.) Abrasion should always be followed by degreasing to remove contaminants and loose particles. Chemical etching is another method to provide a rough surface for improved adhesion.

Instructions
Apply by spreading a thin film approximately 0.005 inch thick over the surface to be bonded. Maintain light pressure during cure for optimum bonding.

Cure Schedule
1.0 – 1.5 hours @ 177°C (350°F); not less than 50 minutes @ 177°C (350°F)

Typical Cured State

<table>
<thead>
<tr>
<th>Test Property</th>
<th>Substrate</th>
<th>ASTM</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Shear Strength @ 25°C (77°F)</td>
<td>Aluminum</td>
<td>D-1002</td>
<td>psi</td>
<td>2,630</td>
</tr>
<tr>
<td>Pure Tensile Strength @ 25°C (77°F)</td>
<td></td>
<td></td>
<td>psi</td>
<td>3,555</td>
</tr>
</tbody>
</table>

Storage
Recommendations regarding storage conditions can be obtained by visiting our web site at www.hexion.com

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 handled, 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.

Contact Information
For product prices, availability, or order placement, please contact customer service:
www.hexion.com/Contacts/

For literature and technical assistance, visit our website at www.hexion.com

DISCLAIMER
The information provided herein was believed by Hexion Inc. (“Hexion”) to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information, to comply with all laws and procedures applicable to the safe handling and use of the product and to determine the suitability of the product for its intended use. All products supplied by Hexion are subject to Hexion’s terms and conditions of sale. HEXION MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY HEXION, except that the product shall conform to Hexion’s specifications. Nothing contained herein constitutes an offer for the sale of any product.