PRE-CATALYZED NADIC METHYL ANHYDRIDE
(NMA 407)

Typical Properties

<table>
<thead>
<tr>
<th>Properties</th>
<th>Values</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight (average)</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>Specific gravity @ 20°C, g/cc</td>
<td>1.2200 ± 0.0100</td>
<td>D-102 (ASTM D 4052)</td>
</tr>
<tr>
<td>Appearance</td>
<td>Clear dark green liquid</td>
<td>D-104 (Visual)</td>
</tr>
<tr>
<td>Viscosity at 25°C, cP</td>
<td>200 - 900</td>
<td>D-237</td>
</tr>
</tbody>
</table>

Applications

NADIC Methyl Anhydride 407 (NMA 407) curing agent formulated with an efficient latent proprietary catalyst that imparts high reactivity at process temperatures, while maintaining excellent pot life. NMA 407 is commonly used to cure epoxy resins in many challenging applications, including fiber reinforced composites used in high performance aerospace and military applications, as well as mechanically demanding applications. NMA 407 is ideal in processes such as pultrusion, filament winding and infusion of parts requiring excellent high temperature performance. The excellent electrical properties and high temperature performance make NMA-cured epoxies outstanding materials for encapsulating electronic components and circuits.

NMA 407 provides the following benefits:

- **Easy Handling:** Low viscosity liquid gives low viscosity mixes with various epoxy resins.
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- **Convenience:** Eliminates the need to add small amounts of catalyst
- **Consistency:** Prevents potential batch-to-batch differences caused by errors in measuring and properly dispersing small amounts of catalyst
- **Low reactivity at room temperature:** Provides long working times and pot lives for mixes with epoxy resins
- **High reactivity at cure temperature:** Gives excellent cure response at cure temperatures.
- **High Performance:** High heat distortion temperature (HDT) and glass transition temperature (Tg). Good thermal stability. Excellent electrical characteristics, including arc resistance. High hardness and impact strength

For more information on the use of anhydrides like NMA 407 as epoxy curing agents, please consult the Technical Bulletin, FORMULATING ANHYDRIDE-CURED EPOXY SYSTEMS, available from Dixie Chemical Company.

**Epoxy Formulations**

NMA 407 was formulated with a variety of epoxy resins. Viscosity was measured at 25°C, and gel time was measured at 170°C. Samples were cured for 1 hour at 150°C, followed by a post-cure of 1 hour at 220°C, and glass transition temperatures were measured using a differential scanning calorimeter. The following table summarizes these results:
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<table>
<thead>
<tr>
<th>Epoxy type</th>
<th>NMA 407, phr</th>
<th>Viscosity at 25 °C, cP</th>
<th>Gel Time 1, min</th>
<th>Tg 2, °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard BPA Liquid Epoxy</td>
<td>89</td>
<td>2090</td>
<td>34</td>
<td>168</td>
</tr>
<tr>
<td>Low Viscosity BPA Liquid</td>
<td>92</td>
<td>1660</td>
<td>33</td>
<td>169</td>
</tr>
<tr>
<td>Cycloaliphatic Epoxy</td>
<td>122</td>
<td>360</td>
<td>31</td>
<td>258</td>
</tr>
<tr>
<td>Epoxy Phenol Novolac</td>
<td>96</td>
<td>1900</td>
<td>33</td>
<td>169</td>
</tr>
<tr>
<td>Epoxy BPA Novolac</td>
<td>87</td>
<td>8000</td>
<td>37</td>
<td>187</td>
</tr>
<tr>
<td>BPF Liquid Epoxy</td>
<td>96</td>
<td>1000</td>
<td>35</td>
<td>155</td>
</tr>
</tbody>
</table>

1. Shyodu Hot Pot (100g at 100°C).
2. Cured 1 hr at 120°C and 1 hr at 220°C. Analyzed in DSC: 40°C/min to 250°C

### Handling & Storage

It is recommended that NMA 407 is stored between the temperatures of 18°C (64°F) and 40°C (104°F) to avoid freezing, although the material is not affected by freezing. If material does freeze, thaw at a temperature below 40°C and mix well before using. Store in a dry place and keep container tightly closed to prevent absorption of atmospheric moisture or contamination. The presence of moisture could cause free acid to form in the anhydride.

NMA 407 will react with water to form diacids. This is normally undesirable, so NMA 407 should be stored in such a way that it is carefully protected from moisture contamination.

For more details on the design of bulk storage for NMA 407, consult the Dixie Chemical Company brochure “Epoxy Curing Agent Storage Requirements.”

### Health Hazards

The data contained herein are furnished for information only and are believed to be reliable. This information is provided only as guidance and is not to be considered a warranty or quality specification. Dixie Chemical Company, Inc. makes no warranties (expressed or implied) as to its accuracy and assumes no liability in connection with any use of this product.
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Read and understand the relevant Safety Data Sheets (SDS) for all products before use. These anhydrides are primary skin and eye irritants. Avoid contact with skin, eyes, and clothing. Use only with adequate ventilation. In case of contact, follow the procedures outlined in the SDS. Generally, these procedures include immediately flushing the affected skin or eyes with copious amounts of water for at least 15 minutes. In the case of eye contact, get medical attention. Wash contaminated clothing before reuse.

Follow the recommendations in the SDS for personal protective equipment when handling these materials. At a minimum, these procedures typically include protective chemical goggles, impenetrable gloves, and measures to avoid breathing chemical vapors.

Availability

NMA 407 is available from Dixie Chemical Company, Inc.'s plant in Pasadena, Texas. Contact your Dixie Chemical Company representative for details.

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