

**An Emerald Performance Materials Company**

## Hypro<sup>®</sup> Reactive Liquid Polymers 1300X13 CTBN & 1300X13F CTBN Carboxyl Terminated Butadiene-Acrylonitrile CAS #68891-46-3

### DESCRIPTION

Hypro Reactive Liquid Polymers (RLP) are 100% solids liquid rubbers used to improve the toughness, flexibility, adhesion and impact resistance of thermoset resin systems including epoxies, vinyl esters, unsaturated polyesters, acrylics and urethanes. These materials are a family of butadiene homopolymers and butadiene-acrylonitrile copolymers with functionality at the chain ends. Functional groups are carboxyl (COOH), amine (NH or NH<sub>2</sub>), methacrylate or epoxy. The acrylonitrile content varies in these polymers from zero to 26% which directly affects the solubility and glass transition temperature (T<sub>g</sub>) of the materials.

Hypro 1300X13 CTBN is a carboxyl terminated butadiene-acrylonitrile copolymer used predominately as a reactant with your base thermoset resin to gain product performance improvements. These resultant pre-reacts (adducts) can be incorporated at various levels to suit the needs of your specific formulation. 1300X13F CTBN is very similar to 1300x13 CTBN in its physical characteristics and performance and meets requirements for food contact applications as cited in 21 CFR 175.300 for resinous and polymeric coatings.

### TYPICAL USES

- Film and Paste Adhesives (Structural and Semi-Structural Applications)
- Coatings (Solution, Powder, Waterborne)
- Composites
- Polymeric Intermediate for Epoxies, Vinyl Esters, Epoxy Acrylates and Phenolics
- End Uses include Aerospace, Automotive, Electrical/Electronics, Industrial, Marine and Construction Applications

### TYPICAL PROPERTIES

|  |  |
|--|--|
| Appearance                                   | Liquid polymer, amber in color<br>(2 - 7 on the Gardner Color Scale) |
| Actives Level                                | 100%   |
| Brookfield Viscosity,<br>mPa.s or cP @ 27° C | 360,000 – 640,000  |
| Bound Acrylonitrile<br>Content, %            | 23.5 - 27.50   |
| Carboxyl Content<br>(Equivalent Per Hundred) | 0.050 - 0.064  |

### BENEFITS/FEATURES

- Enhances the Toughness/Flexibility of Thermoset Resins
- Improves Adhesion to Difficult to Bond to Substrates
- Increases Impact/Crack Resistance
- Improves Durability (Fatigue Resistance)
- Increases Low Temperature Mechanical Properties
- Provides Sound Dampening Properties
- FDA Version Available

### STORAGE & HANDLING

To ensure optimal product performance, store material in original unopened containers at or below 50°C.

| Hypro™ CTB, CTBN and CTBNX Standard Line of Products —Typical Properties |                 |                 |                 |                 |                  |                 |                  |
|--|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|
| Hypro Polymers   | 2000X162<br>CTB | 1300X31<br>CTBN | 1300X8*<br>CTBN | 1300X13<br>CTBN | 1300X13F<br>CTBN | 1300X9<br>CTBNX | 1300X18<br>CTBNX |
| Acrylonitrile Content, %   | 0               | 10              | 18              | 26              | 26               | 18              | 21.5             |
| <u>Carboxyl Content:</u>   |                 |                 |                 |                 |                  |                 |                  |
| -Acid Number   | 25              | 28              | 29              | 32              | 32               | 38              | 39               |
| -EPHR**  | 0.045           | 0.050           | 0.052           | 0.057           | 0.057            | 0.067           | 0.070            |
| Brookfield Visc. mPa.s<br>or cP @ 27°C (81°F)                            | 60,000          | 60,000          | 135,000         | 500,000         | 500,000          | 160,000         | 350,000          |
| Solubility Parameter<br>(cal/cm <sup>3</sup> ) <sup>1/2***</sup>         | 8.14            | 8.46            | 8.82            | 9.15            | 9.15             | 8.87            | 8.99             |
| Specific Gravity<br>25°/25° (77°F)                                       | 0.907           | 0.924           | 0.948           | 0.960           | 0.960            | 0.955           | 0.961            |
| Functionality  | 1.9             | 1.9             | 1.8             | 1.8             | 1.8              | 2.4             | 2.4              |
| Molecular Weight, Mn   | 4,200           | 3,800           | 3,550           | 3,150           | 3,150            | 3,600           | 3,400            |
| Glass Transition Temp.,<br>Tg, °C****                                    | -77             | -66             | -52             | -39             | -39              | -52             | -46              |

\* An FDA version of this polymer is also available.

\*\* Equivalents per hundred rubber. \*\*\* Calculations based on molar attraction constants.

\*\*\*\* Measured via DSC (Differential Scanning Calorimeter).

**Typical Formulation Using Hypro™ 1300X13**

|  | A          | B           | C           | D           |
|--|------------|-------------|-------------|-------------|
| DGEBA Liquid                               | 100        | 92.5        | 87.5        | 77.5        |
| Epoxy/CTBN 1300X13 Adduct (HyPox RA 1340*) | --         | 12.5        | 25          | 37.5        |
| Parts of CTBN (Hypro 1300X13)              | --         | 5           | 10          | 15          |
| Tabular Alumina                            | 40         | 40          | 40          | 40          |
| Omicure DDA10                              | 6          | 6           | 6           | 6           |
| Omicure U405                               | 2          | 2           | 2           | 2           |
| Cab-O-Sil TS 720 (Cabot Corp.)             | 3.5        | 3.5         | 3.5         | 3.5         |
| G <sub>IC</sub> (J/m <sup>2</sup> )**      | 291        | 416         | 453         | 742         |
| Modulus (Mpa)                              | 3,513      | 3,243       | 2,845       | 2,186       |
| Tg°C                                       | 135        | 130         | 129         | 129         |
| T-Peel (PLI) N/mm***                       | (7)<br>1.2 | (10)<br>1.8 | (17)<br>3.0 | (25)<br>4.4 |

\* 1300X13 CTBN adduct in DGEBA resin = 40%

\*\*G<sub>IC</sub> (Fracture Energy) is a measure of the energy required to fracture a material

\*\*\* Cure 20 minutes at 177°C. Substrates oily cold rolled steel.

## **PACKAGING & AVAILABILITY**

Hypro 1300X13 CTBN & Hypro 1300X13F CTBN are available in 55 gal. non-returnable steel drums (net weight 400 lbs.) and 5 gal. plastic pails (35 lbs. net). For further information regarding these materials or any other CVC Thermoset Specialties product, please contact your local Sales Representative or our Customer Service Department at 800-296-0040.



**An Emerald Performance Materials Company**

**Hypro<sup>®</sup> 1300X13 CTBN &  
Hypro<sup>®</sup> 1300X13F CTBN**

## **DISCLAIMER**

The information contained herein is believed to be reliable, but no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications or the results to be obtained there from. The information is based on laboratory work with small-scale equipment and does not necessarily indicate end product performance. Because of the variations in methods, conditions, and equipment used commercially in processing these materials, no warranties or guarantees are made as to the suitability of the products for the applications disclosed. Full-scale testing and end product performance are the responsibility of the user. CVC Thermoset Specialties shall not be liable for and the customer assumes all risk and liability of any use or handling of any material beyond CVC's direct control. THE SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Nothing contained herein is to be considered permission, recommendation, nor as an inducement to practice any patented invention without permission of the patent owner. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES.

CVC Thermoset Specialties—844 N. Lenola Road/Moorestown, NJ 08057  
An Emerald Performance Materials Company

© Copyright 2006 Emerald Performance Materials LLC. 6/2006

**CVC Thermoset Specialties**

844 North Lenola Road / Moorestown, NJ 08057 / Phone: 856-533-3000 / Fax: 856-533-3003 / [www.cvcthermoset.com](http://www.cvcthermoset.com)