HUNTSMAN

Enriching lives through innovation

Advanced Materials

XU 35500 Benzoxazine Resin

Cardanol-Based Monobenzoxazine

PRELIMINARY DATA SHEET

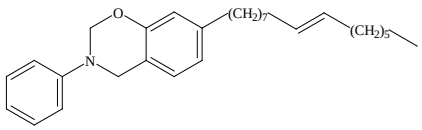
Key Properties

- **Very effective viscosity reducer**
- **Improves tensile and flexural strength**
- **Reduces surface tension and improves wettability**
- **Low moisture uptake**
- **Manufactured from a renewable natural resource**

Description:

XU 35500 is a cycloaromatic molecule bearing a long chain alkyl group prepared from cashew nut shell liquid (CSNL). The use of XU 35500 is advantageous primarily as an additive to reduce the viscosity of benzoxazine and epoxy resins without large decreases in mechanical properties

Chemical Structure



Processing

Resin Transfer Molding (RTM), Vacuum Assisted RTM (VARTM), Film Infusion, Pre-preg

Applications

Composites, Laminating, Electrical , Filament Winding , Casting, Coatings, Floorings and Tooling

Product Data

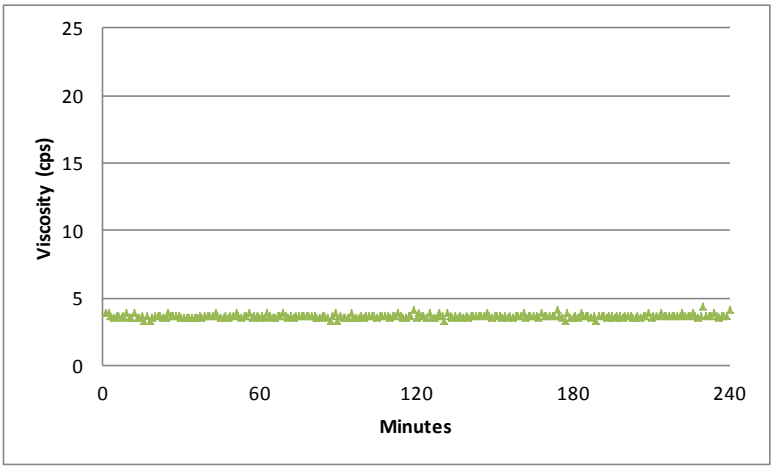
	XU 35500
Visual Appearance	Dark amber-orange liquid
Solid content	>99%
Viscosity at 25 ^{o}C, cps	100-200
Gel time at 200 ^{o}C, min.	90-150

Product data are based on Huntsman testing methods, copies are available upon request

Processing Data

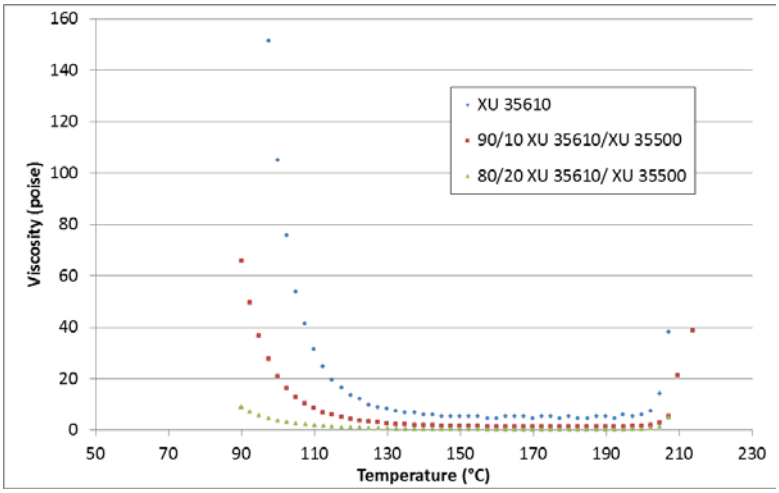
Unless otherwise stated, data was determined with typical production batches using standard testing methods. They are provided solely as technical information and do not constitute a product specification.

Viscosity Build-Up at 100 °C



The graph below shows the viscosity lowering effect of XU 35500 on XU 35610 (Bis A benzoxazine) over the temperature range of 90 to 210°C.

Viscosity vs. Temperature



Formulation and Reactivity *Data*

The information below demonstrates the viscosity and reactivity properties achievable when XU 35500 is blended on a weight by weight basis with XU 35610.

Formulation No.	1	2	3
XU 35610	100	90	80
XU 35500	0	10	20
Viscosity @ 90°C (cps)[1]	53700	7500	934
Viscosity @ 110°C (cps)[1]	2575	675	191
Gel time @ 200°C (sec)	260	292	373

Cured Neat Resin Properties

The information below demonstrates the thermal and mechanical properties achievable when XU 35500 is blended on a weight by weight basis with XU 35610 and cured.

Cure Schedule: 2 hr @ 180°C + 2 hr @ 200°C

Mechanical Properties			
Flexural Test[2]			
Flexural Modulus (MPa)	5530	5185	4468
Flexural Strength (MPa)	99	105	101
% elongation	1.8	2.1	2.3
Tensile Test[3]			
Tensile Modulus (MPa)	5281	4846	4349
Tensile Strength (MPa)	59	67	64
% elongation	1.2	1.5	1.6
Toughness Test[4]			
K_{IC} (MPa^0.5 m)	0.88	0.71	0.63
G_{IC} (J/m^2)	155	101	88

[1] Brookfield CAP 2000+ Viscometer

[2] ASTM D790

[3] ISO 527

[4] Bend Notch ISO 13586

Thermal Properties			
DMA[5]			
Tg (E')°C	156	143	124
Tg (E")°C	172	159	146
Tg (tan delta) °C	187	175	163
Tg hot-wet (E')°C[6]	139	127	108
Tg hot-wet (E")°C[6]	155	142	128
Tg hot-wet (tan delta) °C[6]	173	157	144
Water Absorption (%)[6]	0.83	0.89	0.90

[5] DMA: TA Q800 / ramp @ 10°C / 30-300°C / nitrogen
[6] Water boil 48 hrs.

Storage

XU 35500 reactive diluent resin may be stored for up to 6 months from date of manufacture at temperature of 77°F provided the product is stored in sealed container. The expiration date is provided on the label.

Handling precautions

Caution

Do not use this product until the MSDSs have been read and understood. To protect against any potential health risks presented by our products, the use of proper personal protective equipment (PPE) is recommended. Eye and skin protection is normally advised. Respiratory protection may be needed if mechanical ventilation is not available or is insufficient to remove vapors. For detailed PPE recommendations and exposure control options consult the product MSDS or a Huntsman EHS representative.

Huntsman Advanced Materials warrants only that its products meet the specifications agreed with the user. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications.

The manufacture of materials is the subject of granted patents and patent applications; freedom to operate patented processes is not implied by this publication.

While all the information and recommendations in this publication are, to the best of Huntsman Advanced Material's knowledge, information and belief, accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING BUT WITHOUT LIMIATION, AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.

The behaviour of the products referred to in this publication in manufacturing processes and their suitability in any given end-use environment are dependent upon various conditions such as chemical compatibility, temperature, and other variables, which are not known to Huntsman Advanced Materials. It is the responsibility of the user to evaluate the manufacturing circumstances and the final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.

Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Advanced Materials containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent on manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

Except where explicitly agreed otherwise, the sale of products referred to in this publication is subject to the general terms and conditions of sale of Huntsman Advanced Materials LLC or of its affiliated companies including without limitation, Huntsman Advanced Materials (Europe) BVBA, Huntsman Advanced Materials Americas Inc., and Huntsman Advanced Materials (Hong Kong) Ltd.
Huntsman Advanced Materials is an international business unit of Huntsman Corporation. Huntsman Advanced Materials trades through Huntsman affiliated companies in different countries including but not limited to Huntsman Advanced Materials Americas in the USA and Huntsman Advanced Materials (Europe) BVBA in Europe.

Huntsman Advanced Materials
10003 Woodloch Forest Drive
The Woodlands, Texas 77380

Tel: 888-564-9318
Fax: 281-719-4047
www.huntsman.com/advanced_materials