HUNTSMAN
Enriching lives through innovation

Advanced Materials

HYPOX® RF933#

Reactive Toughener and flexibilizer

DATA SHEET

CTBN-Toughened EPN Adduct

Applications

- Adhesives
- Composites
- Impact resistance Coatings
- Filament winding
- Molding compounds

Properties

HYPOX® RF933 is an Epoxy Phenol Novolac resin modified with CTBN. HYPOX® RF933 has a functionality of 2.6 and an elastomer content of 20%. The rubber improves the toughness of cured epoxy formulations through development of two phases during cure. Compared to DGEBA modified at an equal rubber level, HYPOX® RF933 should provide improved chemical and heat resistance because of its higher functionality. Formulations incorporating HYPOX® RF933 will exhibit improvements in impact and thermal cycling resistance, peel and tensile shear strengths and low-temperature mechanical properties compared to non-rubber-modified epoxy formulations.

HYPOX® RF933 should be considered for use as the sole resin or as a part of the resin component of your formulation. The optimum concentration of HYPOX® RF933 should be determined empirically. Typical applications generally incorporate 5-15 phr (parts per hundred parts resin) rubber to achieve optimal toughness; higher concentrations improve flexibility

- Easy to incorporate into epoxy resin
- Give significant improvement in the impact resistance of cured product
- Storage stable in formulated product
- Minimal decrease of Tg
- Contains a co-reacted resin to improve corrosion resistance

Key data

Specified key data

Epoxy Equivalent Weight (Titration)	**212 – 231**	**[g/eq]**
Viscosity at 25 °C (Brookfield)	**120 – 180**	**[Pa s]**
Color, (Gardner)	**<10**	
Acid Value (Titration)	**<0.1**	

Specified key data are individually checked throughout and guaranteed.

Typical key data

Flash point (Pensky Martens, DIN 51758)	≥ 100	[°C]
Appearance	clear	

Data which is described in this document as 'typical' is not analyzed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.

In addition to the brand name product denomination may show different appendices, which allows us to differentiate between our production sites: e.g. BD = Germany, US = United States, IN = India, CI = China, etc. These appendices are in use on packaging, transport and invoicing documents. Generally, the same specifications apply for all versions. Please address any additional need for clarification to the appropriate Huntsman contact.

Performance Data

Mechanical Properties of CTBN-Toughened Epoxidized Phenol Novolac Resin

Formulation, pbw	1	2	3	4
ARALDITE® GY281	100	60	40	20
HYPOX® RF928	–	50	75	100
OMICURE® DDA 10	6	6	6	6
OMICURE U-52M	0.5	0.5	0.5	0.5
Rubber content, phr	0	10	15	20

Cured Properties

Tensile @ 25 °C	1	2	3	4
Strength, MPa	89	72	62	32
Elongation, %	3.9	4.3	4.0	3.2
Modulus, MPa	3241	2758	2275	1655

Flexural @ 25 °C	1	2	3	4
Strength, MPa	131	104	90	48
Modulus, MPa	3378	2758	2275	1586

Fracture Toughness @ 25 °C	1	2	3	4
K1c, $MN/m^{1.5}$ (Fracture Strength)	0.7	1.7	1.6	1.5
G1c, J/m^2 (Fracture Energy)	128	906	1,050	1,236

Thermal	1	2	3	4
Tg, °C (DSC)	137	127	121	123

Dynamic Mechnical Analysis*	1	2	3	4
Loss Modulus, G˝, Low Temperature Transition Peak, °C	No Peak	-35	NT	-25
Thermal Tg, °C	146	134	NT	132

**Thermal sweep from -50 to +180 °C at 1.6 Hz (10 rads/sec)*
NT = not tested

Storage

HYPOX® RF933 should be stored in a dry place, preferably in the sealed original container, at temperatures between 2 and 40 °C. The product should not be stored exposed to direct sunlight.

Keep away from food, drink and animal feeding stuff.

Handling precautions

HYPOX® RF933 is not a primary skin irritant or sensitizer. However, as with any epoxy material, irritation can result from repeated or prolonged contact. The symptoms of this irritation may appear as a mild reddening or a more pronounced rash. It is, therefore, important to avoid skin contact where possible. Butyl rubber gloves, full eye protection and protective clothing are recommended.
Skin contact: Wash well with soap and water. Remove contaminated clothing and wash thoroughly before reusing. It is recommended that resin not be removed from skin with solvents since solvents increase contact and encourage penetration. Moreover, solvents of themselves dry and crack the skin.
Eye contact: Flush immediately with large quantities of water. Contact a physician.

Refer to the Safety Data Sheet on HYPOX® RF933 for additional safety and health information. The SDS is revised as new data becomes available.

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