

## CTBN Modified Epoxy Adhesives for High Peel Strength

### Scope:

Intent was to develop elastomer modified epoxy adhesives with exceptional impact wedge peel strength. The automotive industry adopted a standard to evaluate the fracture behavior of adhesive joints known as ISO 11343. A wedge is drawn through the bonded portion of a specimen that is shaped like a tuning fork. The wedge velocities are 2 m/s for steel substrates and 3 m/s for aluminum substrates.

### Formulation:

The accelerated dicyandiamide cured epoxy adhesive had the following recipes:

	A	B	C	D	E
Epon 828	77.5	100	77.5	92.5	77.5
HyPox™ 1340	37.5	-	37.5	12.5	37.5
XTJ 542	-	15	5	15	15
Omicure™ DDA 10	5	5	5	5	5
Omicure U405	2	2	2	2	2
Cab-O-Sil TS 720	3	3	3	3	3

Substrate: Electro galvanized steel  
 Bond-line thickness: 10 mils  
 Cure: 30 minutes at 177°C

### Results:

	A	B	C	D	E
HyPox 1340	37.5	0	37.5	12.5	37.5
XTJ-542	0	15	5	15	15
T-Peel, Pli (N/mm.)					
R.T.	37.7 (6.61)	17 (2.98)	50.3 (8.82)	25.1 (4.40)	56.4 (9.89)
-40°C	28.4 (4.98)	11 (1.92)	35.2 (6.17)	12.5 (2.19)	51.3 (9.0)

### Conclusions:

- 1) Realizing that 1340 is 40% by weight rubber recipes A, C, D and E contain 15, 15, 5 and 15 parts of rubber, respectively.
- 2) Comparing recipes A and B, CTBN 1300X13 was appreciably more effective than XTJ-542 in enhancing peel strength.
- 3) An interesting response in adhesive properties occurred in the 20 phr (parts per hundred resin) modifier level with recipes C and D i.e. better peel performance with 15/5 CTBN/XTJ-542 than 15/5 XTJ-542/CTBN.
- 4) At very high modifier concentrations or recipe E there is a significant increase in low temperature peel strength which was the objective in this study.