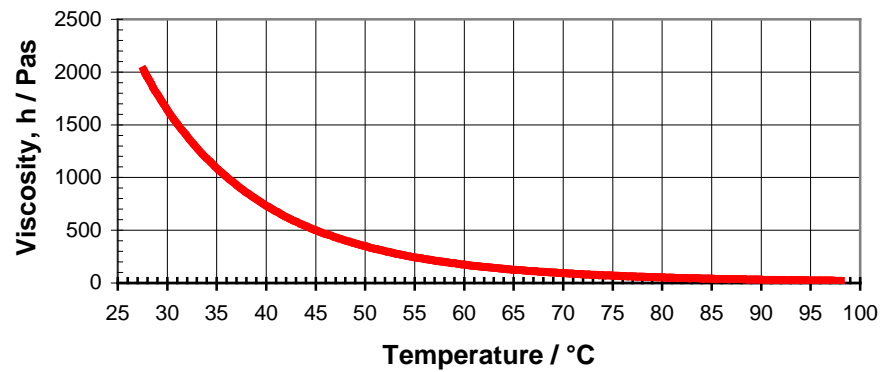
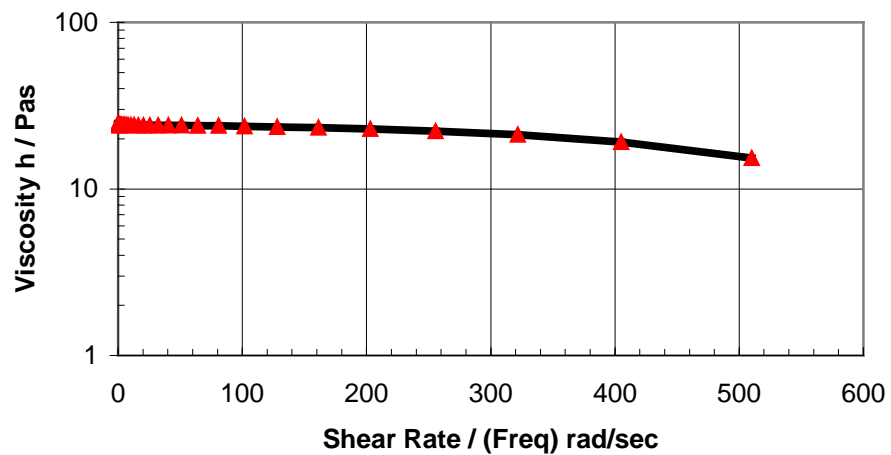


**Advanced Materials****Flexibilizer DY 965**

REACTIVE TOUGHENER FOR EPOXY RESIN COMPOSITIONS  
ADHESION PROMOTER

<b>GENERAL</b>	Recommended for the preparation of high impact resistant epoxy resin compositions. Useful to make adhesives and binders for cathoretic electrodeposition primers. Suitable for the preparation of dust-free electronic preregs. For special binder systems made by the advancement process.	
<b>CHEMICAL DESCRIPTION</b>	Polyol	
<b>APPLICATIONS</b>	Prepreg Adhesive Resin Transfer Molding	
<b>PROPERTIES</b>	Good solubility in epoxy resins and in solvents Extremely good impact resistance and adhesion to steel between -40°C and +80°C in one component epoxy adhesives Toughness improvement of epoxy resin systems Improved adhesion to treated and non-treated aluminum	
<b>TYPICAL PROPERTIES*</b>	Visual Appearance	clear yellow to brownish viscous liquid
	Hydroxyl Value, eq./kg	1.00 - 1.15
	Viscosity @ 40°C (104°F), Pa s (P)	440 – 1280 (4,400 - 12,800)
	Density @ 25°C (77°F), g/cm <sup>3</sup> (lb/gal.)	1.04 (8.7)
	Flash Point, Closed Cup, °C (°F)	>200 (>392)

\* Typical properties are based on Huntsman's test methods. Copies are available upon request.

**Viscosity of Flexibilizer DY 965 by RDA****Viscosity of Flexibilizer DY 965  
versus Temperature****Viscosity of Flexibilizer DY 965 Versus Shear Rate**

**FORMULATIONS****Toughening of multifunctional epoxy with DDS cure**(Tactix<sup>®</sup> 556 / Aradur<sup>®</sup> 9664-1)

The mixing is done at 90°C to 95°C until an homogeneous system is obtained.  
It can then be applied on preregs via hot melt process at 120°C or 140°C.

- Increase of the fracture toughness properties
- Improvement of the impact resistance
- Constant Tg-level

	<b>Unit</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>Tactix<sup>®</sup> 556</b>	pbw	100	100	100
<b>Flexibilizer DY 965</b>	pbw	0	6.6	13.6
<b>Aradur<sup>®</sup> 9664-1</b>	pbw	24	25,2	22.6
Viscosity at 150°C	cPs	100	100	100
Curing cycle		3h 150°C + 3h 170°C + 2h 220°C		
Tg by DMA	°C	194	199	184
Flexural modulus	ksi	457	408	391
Flexural strength at 3.5%	ksi	15.8	14.0	13.6
Flexural strength at break	ksi	17.0	18.5	19.0
Elongation at break	%	3.87	5.60	7.29
Fracture Properties				
K <sub>1c</sub>	in <sup>1/2</sup> •lb/in <sup>2</sup>	540	990	1170
G <sub>1c</sub>	in•lb/in <sup>2</sup>	0.6	1.7	3.1
Coefficient of Linear Thermal Expansion				
α	ppm/°C	62.4	69.0	71.8

**FORMULATIONS  
(CONTINUED)**

**Dust-free high Tg FR4 prepreg with DICY curing**

Blending of Flexibilizer DY 965 in the FR4 resin during the preparation of the varnish.

- Improvement of prepreg aspect (flexible, dust-free)
- Limited Tg drop

	<b>Unit</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>LZ 8383 N80</b>	pbw	100	97	94	90
	on solids				
<b>Flexibilizer DY 965</b>	pbw	0	3	6	10
<b>DICY</b>	pbw	3.5	3.5	3.5	3.5
<b>2-Mi</b>	pbw	0.03	0.03	0.03	0.03
Varnish gel time @ 171°C	s	180	175	175	180

**Prepregging**

Prepreg drying @ 170°C	s			135	
Prepreg flexibility	-	poor	medium	high	tacky
Prepreg dust	-	high	medium	low	none

**Laminate performance** Glass cloth 7628

Curing			1h/180°C		
Tg by DSC	(°C)	178	173	169	168
Solder test at 288°C					
Time to delamination	(min)	2	2	2	3
T 260	(min)	11	10.5	10.5	10.5
PCT 2h					
H2O Absorption	(%)	0.61	0.64	0.68	0.72
Solder 260°C / 25 s	-	pass	pass	pass	pass
Cu peeling	(lb/in)	9	9	9	7.3

**FORMULATIONS  
(CONTINUED)****Adhesion properties of an epoxy/DICY system**

Blending the Flexibilizer DY 965 into Araldite® GY 6010 at 25°C

- It improves the adhesion for non-treated aluminum

	Unit	1	2	3	4	5
Araldite® GY 6010	pbw	100	100	100	100	100
Flexibilizer DY 965	pbw	---	---	10	20	20
DICY	pbw	14	14	14	14	14
Curing Cycle		1hr at 177°C				
Substrate		Al 2024T3 Bare				
Thickness	in	0.0025				
Pretreatment*		None	FPL	FPL	None	FPL
Tensile shear strength	psi	1,915	3,881	4,676	3,373	4,522
Type of Failure						
Adhesive	%	100	80	--	50	--
Cohesive	%	--	20	100	50	100

\* FPL = Forest Products Laboratory Etching Procedure

**PACKAGING & STORAGE**

Flexibilizer DY 965 is available in 396 pound drums. It can be stored at room temperature with a shelf life of one year.

**HANDLING/SAFETY  
PRECAUTIONS**

**Danger ! May cause dermal or respiratory sensitization.**

Do not get in eyes, on skin or clothing.  
Do not inhale mist or vapors.  
Keep container tightly closed when not in use and during transport.  
Wash after handling.  
Ensure adequate ventilation.

**Read Material Safety Data Sheet Before Using.  
For Industrial Use Only.**

**FIRST AID**

**In case of contact :**

**Eyes :** Immediately flush with water for at least 15 minutes. Get immediate medical attention.

**Skin :** Promptly wash thoroughly with mild soap and water.

**Inhalation :** Remove to fresh air. Give oxygen if breathing is difficult.

**Ingestion :** Do not induce vomiting. If conscious, give plenty of water. Get immediate medical attention.

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