954-3

350°F (177°C) curing cyanate matrix

Product Data

Features

- Low moisture absorption
- Excellent resistance to microcracking
- Low outgassing
- Very low minimum viscosity
- Attractive electrical properties
- 350ºF (177ºC) cure
- Available on broad range of fibers and in forms including tape and fabric, and tow
- Autoclave or press mold processable

Description

954-3 is a 350ºF (177ºC) curing cyanate resin with excellent resistance to moisture absorption, outgassing and microcracking. 954-3 is formulated for autoclave or press molding using a standard cure of two hours at 350ºF (177ºC). Glass transition temperature can be maximized by post curing at 450ºF (232ºC). The recommended lay-up procedure is HSP-L3. The recommended cure procedure is HSP-C1 or HSP-C2.

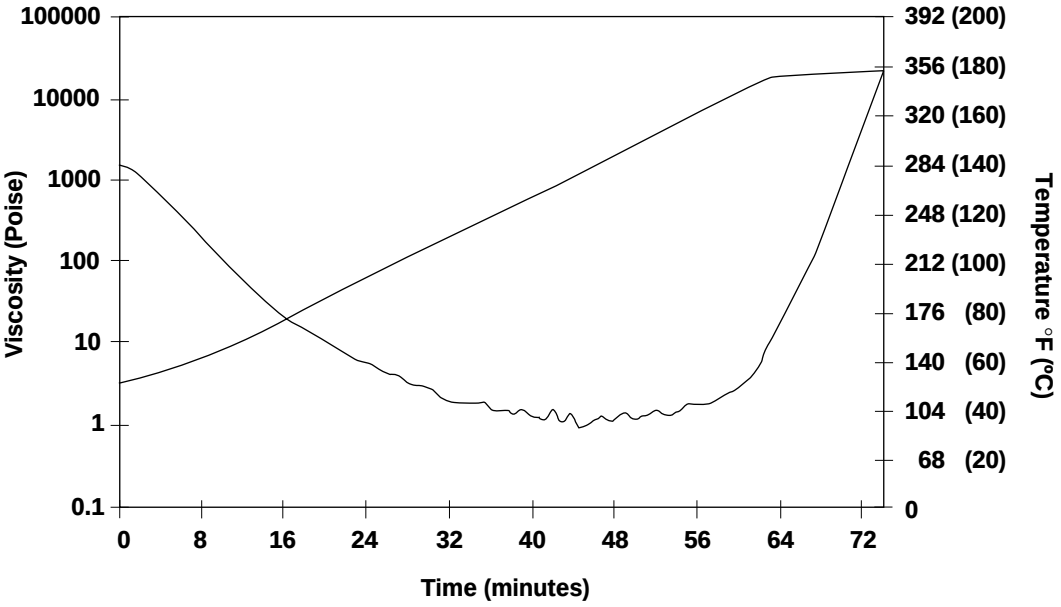
Typical applications for 954-3 include primary and secondary space structures and other applications where dimensional stability is critical.

Typical Neat Resin Properties

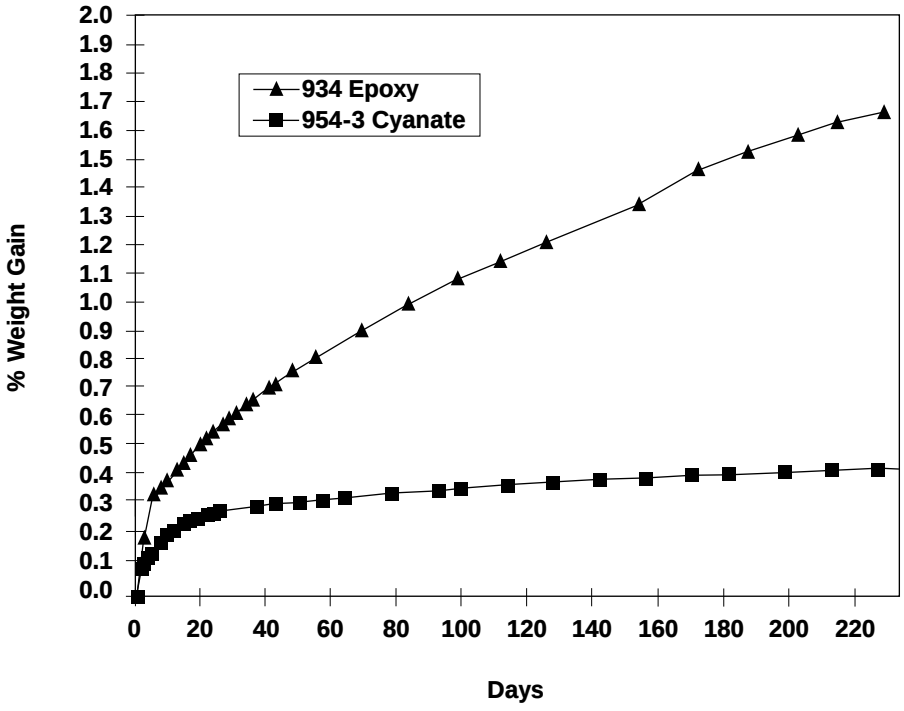
Properties		RT	325ºF (163ºC)	325ºF Wet
Tensile Strength,	**ksi**	8.2		
	MPa	*57*		
Tensile Modulus,	**Msi**	0.4		
	GPa	*2.8*		
Tensile Ult. Strain,	**%**	2.4		
Flex Strength,	**ksi**	17.3	12.6	11.2
	MPa	*119*	*87*	*77*
Flex Modulus,	**Msi**	0.43	0.33	0.30
	GPa	*3.0*	*2.3*	*2.1*
Tg (DMA- δ),	**ºC**			
no post cure		206		
with post cure		258		
Density,	**g/cc**	1.19		
CTE,	**µin/in ºF**	30.6		

Notes: (1) Post-cured 2 hours at 450ºF (232°C)
(2) Wet = 7 day immersion at 160ºF (71°C)

954-3 Viscosity Profile [Ramp to 350°F (177ºC) and hold]



954-3 Neat Resin Moisture Absorption @ RT/50% RH (compared to 934 epoxy)



Dimensional Stability

	954-3[1]	954-3[2]
Hygrostrain, ppm	18.9	108
Water Absorption, %	0.18[3]	0.70[4]
CME, ppm %	105	155

Notes: Hygrostrain divided by %M = CME
Pseudo-isotropic P75 laminates; 30% RC
[1]R. Brand and E. Derby; SPIE conf, 1690, 309. April 1992 (Composite Optics, Inc.)
[2]C. Blair and J. Zakrzewski, SPIE Conf. 1690, 300. April 1992 (Lockheed MSC)
[3]55% RH/EQ
[4]50% GH/EQ

954-3 Resin Outgassing

	954-3	ASTM LIMITS
Total Mass Loss, %	0.20	1.0
Volatile Condensable Mat'l	0.01	0.1
Water Vapor Recovered	0.04	—

Notes: Tested per ASTM E 595

954-3 Neat Resin Dielectrical Properties

Dielectric Properties	RT	325ºF (163ºC)
Unconditioned		
Dielectric Constant (Dk)	2.73	2.73
Loss Tangent (Df)	0.006	0.008
Moisture Conditioned* (1)		
Dielectric Constant (Dk)	2.85	2.85
Loss Tangent (Df)	0.01	0.02

Notes: Moisture Conditioned: 160ºF (71ºC) and 95% RH for 140 days.
Resin specimens cured at 350ºF (177ºC) for 2 hours and post-cured at 428ºF (220ºC) for 2 hours.
Tested to STM 2520D at 10.0 GHz.

Typical Mechanical Properties (Various Fibers)

Property		Fibers (Average Values)					
		G80-600	M55J	M60J	YSH-60A	K13C-2U	K1100
0 Tensile Strength,	**ksi**	323	334	312	332	267	190
	MPa	*2227*	*2303*	*2151*	*2289*	*1841*	*1310*
0 Tensile Modulus,	**Msi**	44	47	53	57	78	82
	GPa	*303*	*324*	*365*	*391*	*538*	*565*
90 Tensile Strength,	**ksi**	5.7	5.0	—	4.7	3.0	—
	MPa	*39*	*35*	—	*32*	*20*	—
90 Tensile Modulus,	**Msi**	0.80	0.90	—	5.6	0.73	—
	GPa	*5.5*	*6.2*	—	*38*	*5.1*	—
0 Comp. Strength,	**ksi**	131	138	134	69	53	39
	MPa	*903*	*951*	*924*	*476*	*366*	*269*
0 Comp. Modulus,	**Msi**	43	44	50	49	76	82
	GPa	*296*	*306*	*343*	*335*	*525*	*565*
0 IL Shear Strength,	**ksi**	10.5	11.6	11.3	9.4	6.9	3.4
	MPa	*72*	*80*	*78*	*65*	*47*	*23*

Notes: 0 degree tensile and compression values are normalized to 60% fiber volume.
All testing performed at RT.

Thermal Cycle Evaluation

Materials	0 Cycles # cracks/in.	10 Cycles # cracks/in.	50 Cycles # cracks/in.	100 Cycles # cracks/in.
954-3/M55J, 0º	0	0	0	0
954-3/M55J, 90º	0	0	1.25	1.25

Notes: Laminate configuration is $(45, -45, 0, 90)_{4S}$
Thermal cycle: -250ºF (-157°C) to 250ºF (121°C) at 20ºF/min, 5 minutes hold.

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