



HexPly® M76

275°F (135°C) curing epoxy matrix



Product Data Sheet

Features

- Toughened epoxy exhibiting “co-continuous” morphology
- Excellent impact resistance
- Versatile cure temp; 275°F (135°C) to 350°F (177°C)
- Controlled flow
- Available in a broad range of reinforcements for both tapes and fabrics
- Autoclave or press mold processing
- Low outgassing

Description

HexPly® M76 is a versatile curing toughened epoxy resin that can be cured from 275°F (135°C) to 350°F (177°C), depending on service temperature requirements. HexPly® M76 is formulated for lower temperature autoclave or press mold processing.

The recommended lay-up procedure for HexPly® M76 is HSP-L4. The recommended cure procedures are HSP-C5 (275°F) or HSP-C1 (350°F).

Typical applications for HexPly® M76 include aircraft primary and secondary structures, space structure, and any application where impact resistance and lightweight as well as versatile cure conditions are required.

Typical Neat Resin Physical Properties

Properties		RT	250°F (121°C) Wet
Comp. Strength	ksi	26.0	
	MPa	179	
Flexural Strength	ksi	22.4	11.3
	MPa	154	78
Flexural Modulus	Msi	0.57	0.44
	GPa	3.9	3.0
Density	g/cm ³	1.30	
K _{1C} , Mpa-m ^{1/2}		1.59	
G _{1C} , J/m ²		638	
RDS DMA Tg, °C [tested @ 9°F/min (5°C/min)]			
G'		165	
G''		173	
Tan Delta		185	

All resin castings cured at 300°F (149°C) for 6 hours.

Wet = 14-day water immersion at 160°F (71°C).

Flexural testing performed using a 3-point loading fixture and a 16:1 S/D ratio.

K_{1C} and G_{1C} tested using 3-point bending mode.



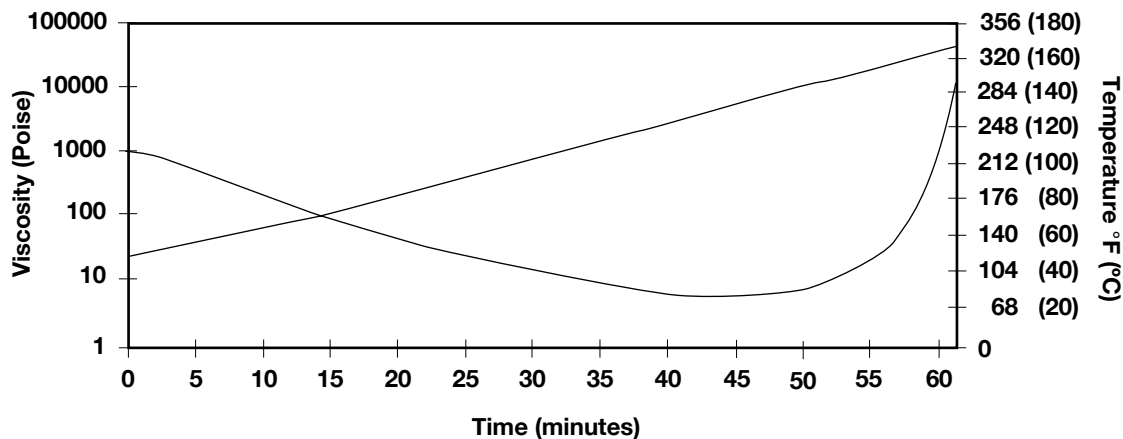
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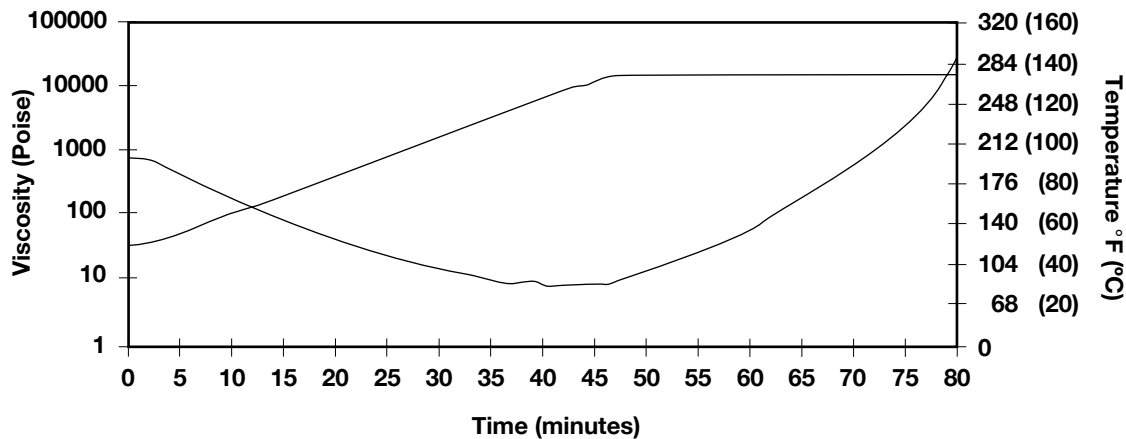


Product Data Sheet

977-6 Viscosity Profile [Ramp to 350°F (177°C)]



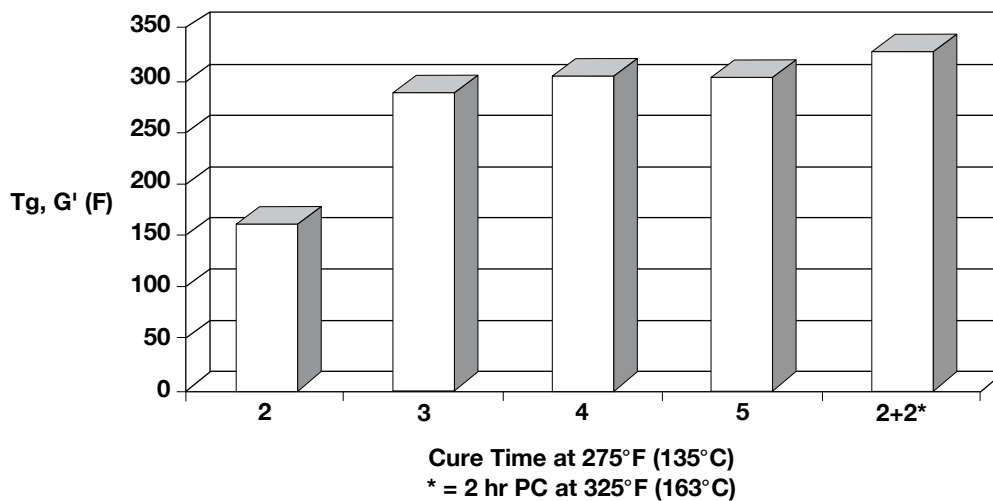
Ramp to 275°F (135°C) and Hold



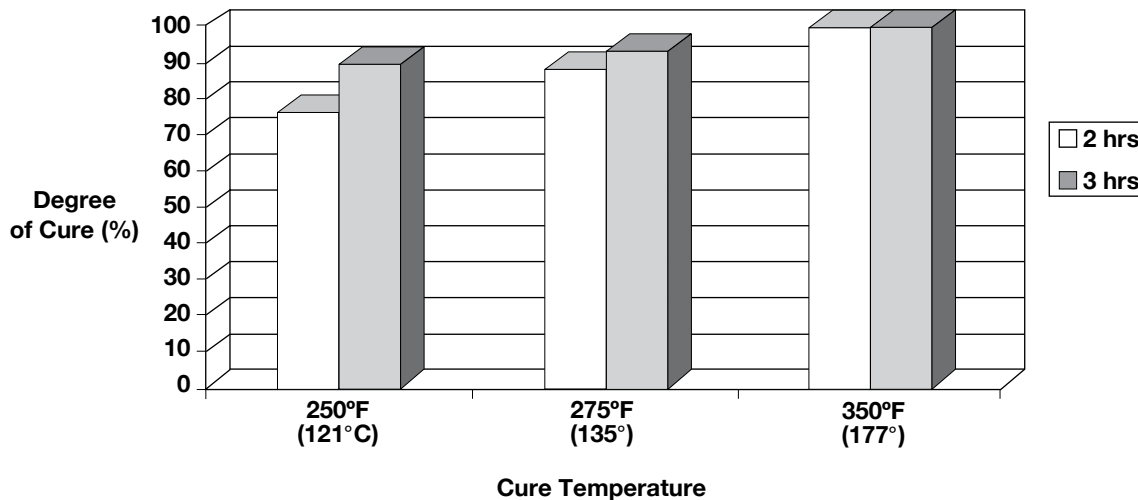
The data tested has been obtained from carefully controlled samples considered to be representative of the product described. Because the properties of this product can be significantly affected by the fabrication and testing techniques employed and since Hexcel does not control the conditions under which its products are tested and used, Hexcel cannot guarantee that the properties listed will be obtained with other processes and equipment.



Glass Transition Temperature (IM7/HexPly® M76 Laminate)

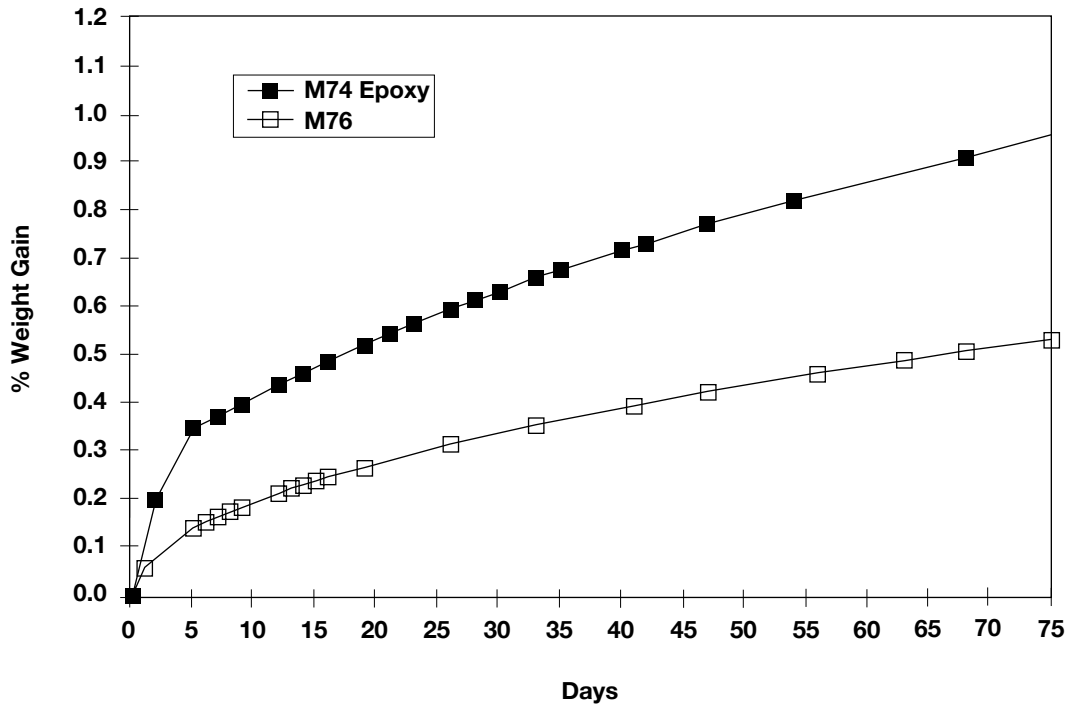


DSC Degree of Cure (977-6 Neat Resin)





HexPly® M76 Neat Resin Moisture Absorption at RT/50% RH (compared to HexPly® M74* epoxy)





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Prepreg Out Time Evaluation (HexPly[®] M46J/HexPly[®] M76)

Property	Test Method	Day 1	Day 7	Day 14	Day 21	Day 28	Day 42	Day 56
Tack	T1	Pass	Pass	Pass	Fail	Fail	Fail	Fail
Drape	D4	Pass	Pass	Pass	Pass	Pass	Fail	Fail
Flow, %	F62	7.8	7.9	7.8	8.6	8.8	6.8	7.5
Tg (G'), °C	T41	159	159	159	160	158	158	157
SB Shear, ksi (MPa)	ASTM 2344	15.0 (103)	14.7(101)	14.7(101)	14.7(101)	14.8 (102)	14.1 (97)	14.5 (100)

Notes: Prepreg stored in sealed bag at RT for specified number of days.

Laminate Outgassing (HexPly[®] M55J/HexPly[®] M76)

Property	Test Method	Average
TML%	ASTM E 595	0.13
CVCM%	ASTM E 595	0.00
WVR%	ASTM E 595	0.07



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Typical Mechanical Properties (Various Fibers)

Property		Fibers (Average Values)			
		Test Temp	M46J	M55J	K139
0° Tensile Strength	ksi	RT	315	313	278
	MPa		2172	2157	1916
0° Tensile Modulus	Msi	RT	39.6	49.0	60.5
	GPa		273	338	417
90° Tensile Strength	ksi	RT	8.4	5.2	3.6
	MPa		58	36	25
90° Tensile Modulus	Msi	RT	1.08	0.94	0.80
	GPa		7.4	6.5	5.5
0° Comp. Strength	ksi	RT	157	152	59.0
	MPa		1082	1048	407
0° Comp. Modulus	Msi	RT	34.6	43.2	60.0
	GPa		239	298	414
0° Flexural Strength	ksi	RT	199	172	97.2
	MPa		1372	1186	670
	Msi	250°F	144	138	—
	GPa		993	951	—
0° Flexural Modulus	Msi	RT	33.0	42.9	50.5
	GPa		228	296	348
	Msi	250°F	34.7	41.5	—
	GPa		239	286	—
0° IL Shear Strength	ksi	RT	14.2	11.7	12.0
	MPa		98	81	83
	ksi	250°F	8.84	8.72	—
	MPa		61	60	—

Notes: 0 degree tensile, compression, and flexural values are normalized to 60% fiber volume.



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HexPly® M76/IM7 Unidirectional Tape

Laminate Mechanical Properties	-75°F (-57°C)	RT	180°F (82°C)		200°F (93°C)	220°F(104°C)
			Dry	Wet	Wet	Wet
0° Tensile Properties						
Strength, ksi (MPa)	371 (2558)	355 (2447)				
Modulus, Msi (GPa)	22.6 (156)	22.3 (154)				
Strain, %	1.55	1.55				
90° Tensile Properties						
Strength, ksi (MPa)	13.0 (90)					
Modulus, Msi (GPa)	1.22 (8.4)					
Strain, %	1.12					
0° Compression Properties						
Strength, ksi (MPa)		229 (1579) 212	212 (1462)	186 ¹ (1282)		
0° Flexural Properties						
Strength, ksi (MPa)		236 (1627)	191 (1317)	146 (1007)		
Modulus, Msi (GPa)		20.9 (144)	19.6 (135)	19.0 ¹ (131)		
0° Interlaminar Properties						
Strength, ksi (MPa)		17.5 (121)	14.3 (99)	10.9 (75)		
Weight Gain, %				1.0		
IPS Properties (±45 tension)						
Modulus, Msi (GPa)		0.76 (5.2)		0.61 ² (4.2)	0.46 ² (3.2)	0.42 ² (2.9)
Weight Gain, %				1.0	1.0	1.0

Notes: ¹Wet = 14 day immersion in 160°F (71°C) water.
²Wet = 150°F (66°C)/85% RH to equilibrium (approximately 1.1% weight gain).
All data reported is based on actual specimen thickness.

HexPly® M76/IM7 Unidirectional Tape

Laminate Mechanical Properties	-75°F (-59°C)	RT	180°F (82°C)
			Wet
Open Hole Compression			
(25/50/25 orientation)			
Strength, ksi (MPa)		47.5 (327)	33.0 (228)
Edge Delamination Strength, ksi (MPa)			
Onset	46.0 (317)		
Ultimate	101 (696)		
Compression After Impact			
(25/50/25 orientation)			
1500 in-lb/in. impact level			
Strength, ksi (MPa)		40 (276)	
Interlaminar Fracture Toughness			
G1 _{IC} (DCB), in-lb/in.		1.9	
G1 _{IC} (ENF), in-lb/in		6.5	

Notes: ¹Wet = 14 day immersion in 160°F (71°C) water.
²Wet = 150°F (66°C)/85% RH to equilibrium (approximately 1.1% weight gain).
All data reported is based on actual specimen thickness.



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HexPly® M76/IM7 Unidirectional Tape

	Test Temp °F (°C)	M76/42%/G1094/C 5HS intermediate modulus fiber 290 gsm	M76/42%/G1087/C 5HS M46J high modulus fiber 275 gsm	M76/42%/G793/C 5HS high strength fiber 280 gsm	M76/42%/G1089/C Twill 2x2 intermediate modulus fiber 200 gsm
Tensile Strength Ksi (MPa) (pr EN 2561 type B)	74 (23)	149 (1030)	101 (700)	104 (718)	–
Tensile Modulus MSi (GPa) (pr EN 2561 type B)	74 (23)	9.8 (68)	14.8 (102)	8.7 (60)	–
Inter Laminar Ksi Shear Strength (MPa) (pr EN 2563)	74 (23) 210 (100) 270 (130)	11 (77) 5.8 (40) –	9.3 (64) 4 (28) –	11.4 (79) 7.1 (49) –	13 (90) 8.9 (61) –
Compression	74/210	100/72			94/82
Strength, Ksi (MPa)	(23/100)	(695/495)	–	–	(651/569)
Modulus, (GPa)	74/210	10.3/10.1			9.3/10.3
(pr EN 2850 type A)	(23/100)	(71/70)	–	–	(64/71)

Results normalized to 60% fiber volume.

Prepreg Storage Life

- Out Life @ room temperature 14 days
- Shelf Life @ 0°F (-18°C) 12 months (*maximum, from date of manufacture*)

For more information

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- HexForce® reinforcements
- HexBond™ adhesives
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- HiMax® multiaxial reinforcements
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- Polyspeed® laminates & pultruded profiles
- HexPly® prepregs
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- HexMC®-i molding compounds
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