

# 4550



## 375°F (191°C) Cure Toughened BMI Resin System

### Typical applications

Tooling  
Engine components  
Hi-temp structural components

### Tack Life

14 days at 70°F (21°C)

### Out life

28 days at 70°F (21°C)

### Shelf life

6 months at 40°F (4°C)

24 months at 0°F (-18°C)

## Description

4550 is a toughened bismaleimide (BMI) resin system. Versatile processing, excellent mechanical properties, and long out time make 4550 especially suited for aerospace, general aviation, and industrial markets. 4550 is a cost-competitive solution for applications with very high temperature requirements.

## Benefits/features

- High  $T_g$  of 530°F (277°C)
- Versatile cure, post cure cycles
- Intrinsically toughened
- Low CTE (coefficient of thermal expansion)
- Great thermal cycling
- Good drape
- Medium tack

## Application

Due to 4550's high  $T_g$  and excellent mechanical properties, typical applications for 4550 include primary and secondary aircraft structures and areas where hot/wet performance and impact resistance are important (i.e. fuselage skins, engine nacelles, wing spars and skins, etc.) This material can be used to manufacture high temperature tooling, providing extended tool life when compared to standard epoxy options.

4550 can be supplied with most commercially available fibers (carbon, quartz, aramid, S-glass, E-glass, etc.) in both woven, unidirectional tape, and hot melt tow.

Woven fabrics are available in standard commercial widths up to 50 inches (1.2m). Unitape widths up to 50 inches (1.2m) are available in standard fiber weights ranging from 70–300gsm (0.014–0.060psf).

## Processing conditions

4550 can be cured as low as 325°F (162°C). Material can be oven, press, and autoclave cured. Please contact your account manager or MCCFC technical support to discuss specific applications.

## Recommended autoclave cure cycle

Apply full vacuum and 100psi (690 kPa), ramp with 3°F/min (1.7°C/min), step cure for 45 min at 250°F (121°C), then cure for 6 hours at 375°F (190°C), cool to <140°F (60°C), followed by free-standing post cure at 410-460°F (210-238°C) for 6 hours. Cool to RT before removal.

Alternate cure cycles available depending on final  $T_g$  requirements.  
Specific step cures may be necessary where flow management is important.



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CARBON FIBER AND COMPOSITES

Technical Data Sheet

## Neat resin [values are average and do not constitute a specification]

Property	Value
Gel time @ 375°F (191°C), minutes	4-5
T <sub>g</sub> Dry (DMA, E'), °F (°C)	530 (277)
CTE, ppm/°C	50±10

## Mechanical data [values are average and do not constitute a specification]

34-700 Uni carbon, 200gsm, 35%RC, autoclave cure, 85 psi, ramp of 3°F/min, 375°F for 6 hours, post cure for 6 hours at 410°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)		370 (2550)
0° Tensile modulus, Msi (GPa)		20.6 (142)
0° Tensile elongation at ultimate, %		1.72%
0° Tensile poisson ratio	ASTM D3039 Type I	0.286
90° Tensile strength, ksi (MPa)		7.02 (48.4)
90° Tensile modulus, Msi (GPa)		1.64 (11.3)
90° Tensile elongation at ultimate, %		0.75%
0° Compression strength, ksi (MPa)		252 (1740)
0° Compression modulus, Msi (GPa)		20.3 (140)
90° Compression strength, ksi (MPa)	ASTM D695mod	65.4 (451)
90° Compression modulus, Msi (GPa)		1.66 (11.4)
0° Flexural strength, ksi (MPa)		343 (2360)
0° Flexural modulus, Msi (GPa)		19.8 (137)
90° Flexural strength, ksi (MPa)	ASTM D790	19.1 (132)
90° Flexural modulus, Msi (GPa)		1.38 (9.51)
0° ILSS (short beam shear), ksi (MPa)		20.3 (140)
90° ILSS (short beam shear), ksi (MPa)	ASTM D2344	2.91 (20.0)
0° In-plane shear strength, ksi (MPa)		23.3 (161)
0° In-plane shear modulus, Msi (GPa)	ASTM D3518	3.61 (24.9)





TR30S 3KPW Carbon fabric, 200gsm, 38%RC, autoclave cure, 85 psi, vent at 22 psi, ramp of 3°F/min, 1<sup>st</sup> step cure for 1 hour at 290°F, 2<sup>nd</sup> step cure for 1 hour at 310°F, 3<sup>rd</sup> step cure for 1 hour at 375°F, post cure for 4 hours at 410°F.

Property	Test method	RT
0° Tensile strength, ksi (MPa)		118 (814)
0° Tensile modulus, Msi (GPa)		10.3 (71.0)
0° Tensile elongation at ultimate, %	ASTM D638 Type I	4.91%
90° Tensile strength, ksi (MPa)		86.2 (594)
90° Tensile modulus, Msi (GPa)		9.23 (63.6)
90° Tensile elongation at ultimate, %		3.41%
0° Compression strength, ksi (MPa)		93.6 (645)
0° Compression modulus, Msi (GPa)		10.0 (68.9)
0° Compression elongation at ultimate, %	ASTM D695	0.31%
90° Compression strength, ksi (MPa)		70.9 (489)
90° Compression modulus, Msi (GPa)		9.76 (67.3)
90° Compression elongation at ultimate, %		0.34%
0° Flexural strength, ksi (MPa)		146 (1010)
0° Flexural modulus, Msi (GPa)	ASTM D790	7.93 (54.7)
90° Flexural strength, ksi (MPa)		132 (910)
90° Flexural modulus, Msi (GPa)		7.60 (52.4)
0° ILSS (short beam shear), ksi (MPa)	ASTM D2344	10.0 (70.0)
90° ILSS (short beam shear), ksi (MPa)		9.62 (66.3)
In-plane shear strength, ksi (MPa)	ASTM D3518	31.3 (216)
In-plane shear modulus, Msi (GPa)		2.96 (20.4)

### Thermal cycling data [values are average and do not constitute a specification]

6K 2X2 Twill carbon fabric, 370gsm, 35%RC, autoclave cured, 100 psi, ramp of 3°F/min, step cure for 45 min at 250°F, cure for 6 hours at 375°F, post cure for 6 hours at 410-460°F, normalized to 60%FV

Thermal cycle definition: 1-5°F/min to 365±10°F, hold for 6 hours, cool below 100°F at 1-5°F/min.

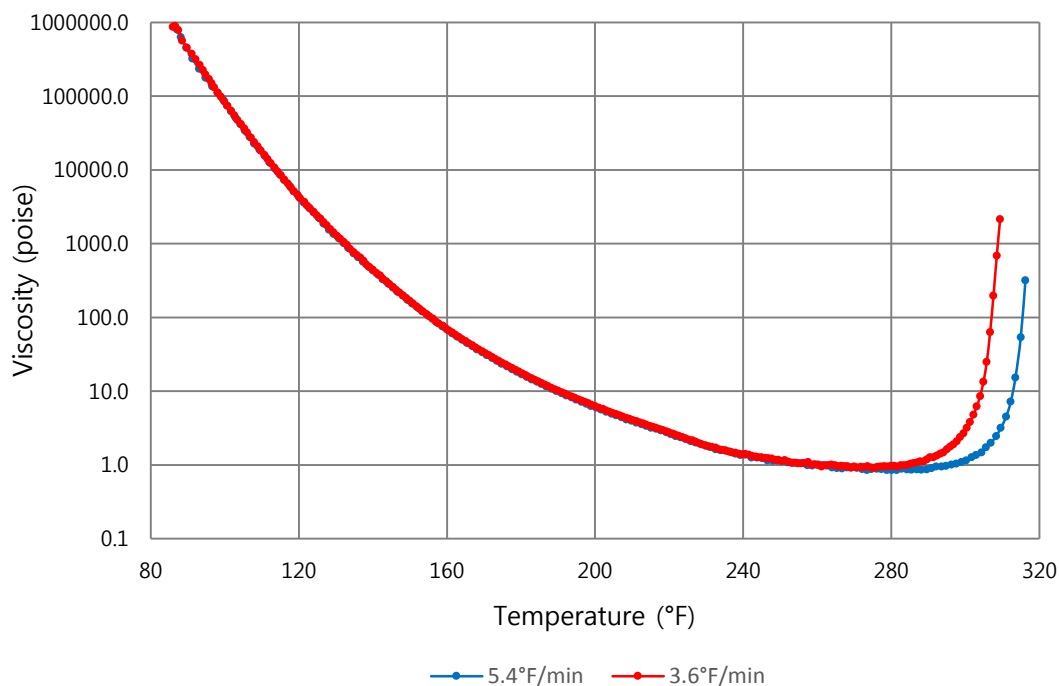
Property	Test method	Thermal cycles	RT	365°F (185°C)
Compression strength, ksi (MPa)	ASTM D6641	0	101 (696)	87.1 (601)
Compression modulus, Msi (GPa)		0	8.45 (58.3)	8.81 (60.7)
Flexural strength, ksi (MPa)	ASTM D7264	0	121 (834)	91.9 (634)
		250	92.6 (638)	82.9 (572)
		500	70.5 (486)	60.2 (415)
Flexural modulus, Msi (GPa)		0	7.85 (54.1)	7.84 (54.1)
		250	7.99 (55.1)	7.92 (50.6)
		500	7.66 (52.8)	7.43 (51.2)
ILSS (short beam shear), ksi (MPa)	ASTM D2344	0	6.93 (47.8)	7.41 (51.1)
		250	5.91 (40.7)	6.02 (41.5)
		500	5.86 (40.4)	5.52 (38.1)
In-plane shear strength, ksi (MPa)	ASTM D3518	0	11.3 (77.9)	9.49 (65.4)
In-plane shear modulus, Msi (GPa)		0	0.762 (5.25)	0.638 (4.40)

Note: Data is from a certified outside lab.

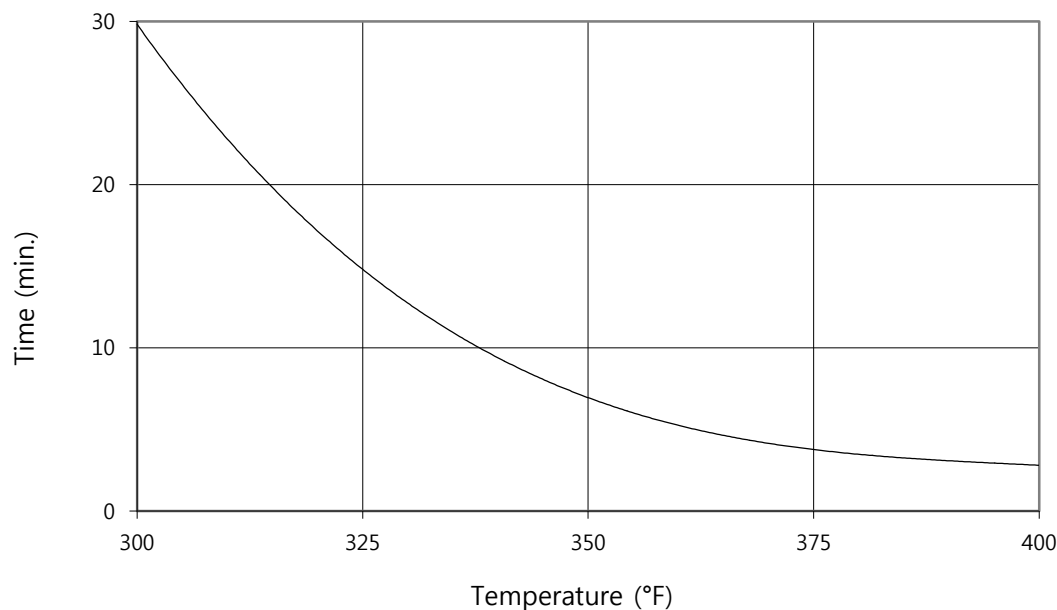


## 4550 Viscosity vs. temperature

TA - AR2000 parallel plate rheometer



## Gel time vs. temperature



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CORPORATE OFFICE  
Composite Materials Division  
1822 Reynolds Avenue  
Irvine, CA 92614

Tel: (949) 253-5680  
Fax: (949) 253-5692  
[www.mccfc.com](http://www.mccfc.com)  
compositesales@mccfc.com

**THE KAITAKI COMPANY**

Mitsubishi Chemical Holdings Group