

321



250-300°F (121-149°C) High T_g Epoxy Resin System

Typical applications

General aviation
Aerospace
Industrial
Sporting goods

Out life

21 days at 70°F (21°C)

Shelf life

3 months at 40°F (4°C)
6 months at 0°F (-18°C)

Description

321 is a 250°F (121°C) to 300°F (149°C) cure, toughened, high T_g, controlled flow epoxy resin system. Versatile processing and excellent mechanical properties make 321 suitable for general aviation, aerospace, sporting goods and industrial markets. FAA approved (AGATE) design allowable database is available for certain material combinations.

Benefits/features

- High dry and wet T_g
- Excellent mechanical properties
- B-basis design allowable database
- Moderate tack
- Good toughness
- Controlled flow

Application

The high T_g and excellent mechanical properties make 321 an ideal product for the general aviation, aerospace and other markets where products are required to retain their mechanical properties under demanding temperatures.

321 can be supplied with most commercially available fibers (carbon, quartz, aramid, S-glass, E-glass, etc.) in both woven form (designated as NB) and unidirectional tape (designated as NCT).

Woven fabrics are available in standard commercial widths up to 60 inches (1.5 m). Unitape widths up to 39 inches (1 m) are available in standard fiber weights ranging from 70-300 gsm (0.014-0.060 psf).

Variants

- 321-1: Increased tack
- 321LS: Metal mesh reinforced adhesive

Recommended processing conditions

321 can be cured at temperatures from 250°F - 300°F (121°C - 149°C) depending on part size and complexity. Low, medium and high pressure molding techniques may be used for curing. Recommended cure cycle is 50 psi (345 kPa); 3°F (1.7°C)/min ramp to 275°F (135°C); hold for 60 minutes, cool to <140°F (60°C). Post curing at 325 (163°C) is possible if higher T_g is required.



MITSUBISHI CHEMICAL
CARBON FIBER AND COMPOSITES

Technical Data Sheet

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

Property	Value
Gel time @ 275°F (135°C), minutes	5 – 7
Specific gravity	1.22
T _g (DMA, E'), °C (°F)	150 (300)

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

34-700 Uni carbon, 36%RC, autoclave cured, 60 minutes at 275°F, 80psi, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	304 (2090)
0° Tensile modulus, Msi (GPa)		18.7 (128)
0° Compressive strength, ksi (MPa)	ASTM D695	230 (1580)
0° Compressive modulus, Msi (GPa)		21.3 (146)
0° Flexural strength, ksi (MPa)	ASTM D790	261 (1800)
0° Flexural modulus, Msi (GPa)		18.2 (125)
Short beam shear strength, ksi (MPa)	ASTM D2344	15.5 (96.5)

Hexcel NAS-S 12K Uni carbon, 150gsm, 36%RC, vacuum bag cured, 100 minutes at 270°F, normalized by CPT=0.006in (55%FV) [AGATE]

Property	Test method	-65°F (-53°C)	RT	175°F (79°C) wet*
0° Tensile strength, ksi (MPa)		291 (2000)	296 (2040)	269 (1850)
0° Tensile modulus, Msi (GPa)		19.0 (130)	18.6 (128)	18.6 (128)
Poisson's ratio	ASTM D3039	-	0.3	-
90° Tensile strength, ksi (MPa)		7.3 (50)	7.1 (48)	4.7 (32)
90° Tensile modulus, Msi (GPa)		1.3 (8.9)	1.2 (8.2)	0.9 (6)
0° Compressive strength, ksi (MPa)		196 (1350)	172 (1180)	124 (855)
0° Compressive modulus, Msi (GPa)		17.0 (117)	17.9 (123)	17.7 (122)
90° Compressive strength, ksi (MPa)	SACMA 1R-94	40 (270)	32 (220)	24 (160)
90° Compressive modulus, Msi (GPa)		1.6 (11)	1.6 (11)	1.1 (7.5)
In-plane shear strength, ksi (MPa)	ASTM D5379	25 (170)	21 (140)	14 (96)
In-plane shear modulus, Msi (GPa)		0.7 (4)	0.6 (4)	0.5 (3)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	-	13.1 (90)	-

*175°F, 85%RH until equilibrium





Hexcel AS4C-M 3K PW, 42%RC, vacuum bag cured, 100 minutes at 270°F, normalized by CPT=0.0085in (50%FV) [AGATE]

Property	Test method	-65°F (-53°C)	RT	175°F (79°C) wet*
0° Tensile strength, ksi (MPa)		81 (550)	87 (600)	74 (510)
0° Tensile modulus, Msi (GPa)	ASTM D3039	7.9 (54)	9.3 (64)	8.2 (56)
Poisson's ratio		-	0.06	-
0° Compressive strength, ksi (MPa)	SACMA 1R-94	79 (540)	71 (480)	57 (390)
0° Compressive modulus, Msi (GPa)		7.8 (53)	8.2 (56)	8.4 (57)
In-plane shear strength, ksi (MPa)	ASTM D5379	18 (120)	17 (110)	11 (75)
In-plane shear modulus, Msi (GPa)		0.7 (4)	0.6 (4)	0.4 (2)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	-	8.8 (60)	-

*175°F, 85%RH until equilibrium

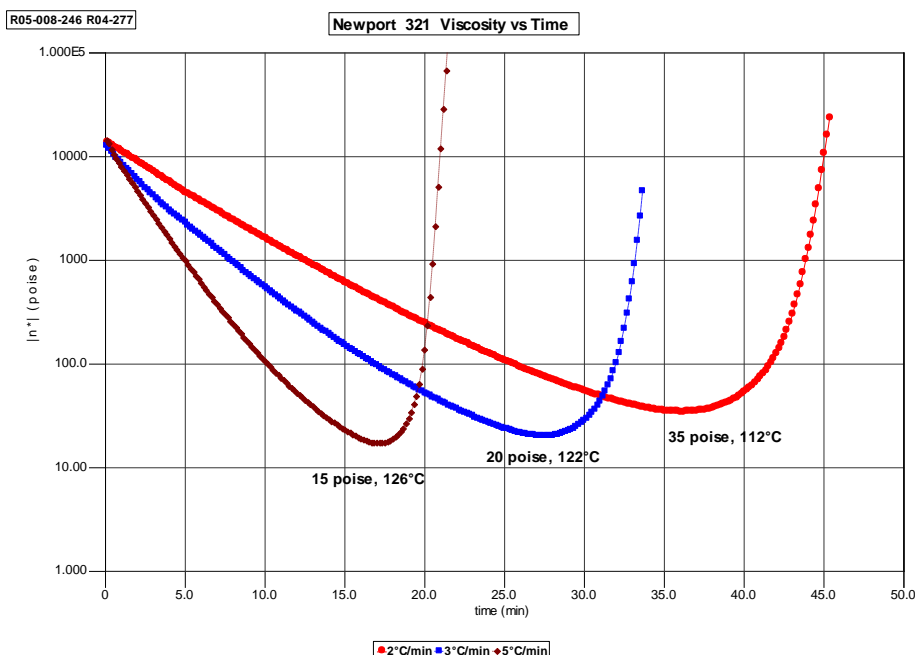
7781 E-glass fabric 38%RC, vacuum bag cured, 100 minutes at 270°F, normalized by CPT=0.0098in (48%FV) [AGATE]

Property	Test method	-65°F (-53°C)	RT	175°F (79°C) wet*
0° Tensile strength, ksi (MPa)		65 (440)	62 (420)	42 (280)
0° Tensile modulus, Msi (GPa)	ASTM D3039	4.0 (27)	4.1 (28)	3.4 (23)
Poisson's ratio		0.16	0.14	-
0° Compressive strength, ksi (MPa)	SACMA 1R-94	97 (660)	78 (530)	56 (380)
0° Compressive modulus, Msi (GPa)		3.9 (26)	3.9 (26)	3.8 (26)
In-plane shear strength, ksi (MPa)	ASTM D5379	23 (150)	19 (131)	13 (89)
In-plane shear modulus, Msi (GPa)		0.7 (4)	0.6 (4)	0.4 (2)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	-	9.4 (64)	-

*175°F, 85%RH until equilibrium

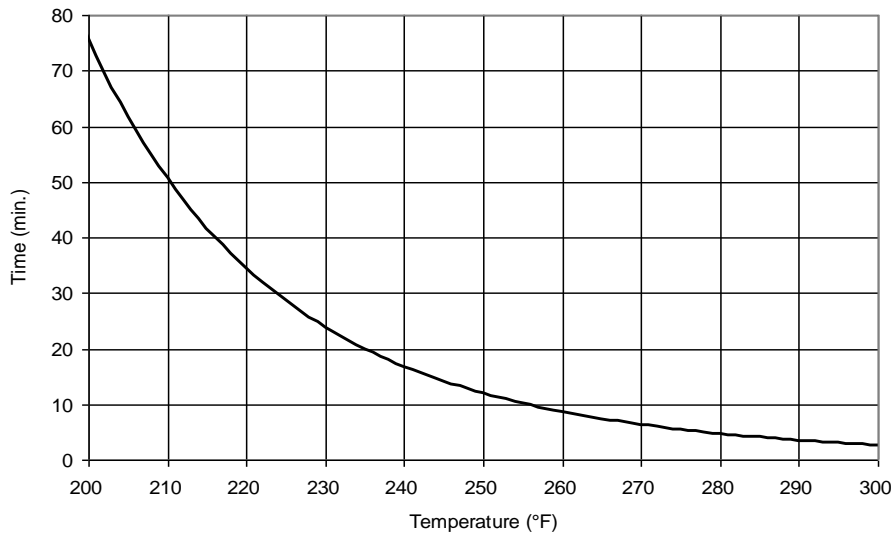
Viscosity profile

TA - AR2000 parallel plate rheometer



Gel curve

Gel Time vs Temperature



MITSUBISHI CHEMICAL
CARBON FIBER AND COMPOSITES

Technical Data Sheet

The information contained herein has been obtained under controlled laboratory conditions and are typical or average values and do not constitute a specification, guarantee, or warranty. Results may vary under different processing conditions or in combination with other materials. The data is believed to be reliable but all suggestions or recommendations for use are made without guarantee. You should thoroughly and independently evaluate materials for your planned application and determine suitability under your own processing conditions before commercialization. Furthermore, no suggestion for use or material supplied shall be considered a recommendation or inducement to violate any law or infringe any patent.

CORPORATE OFFICE
Composite Materials Div.
1822 Reynolds Ave.
Irvine, CA 92614

Tel: (949) 253-5680
Fax: (949) 253-5692
<http://www.mrcfac.com>
compositesales@mrcfac.com

THE KAITEKI COMPANY
Mitsubishi Chemical Holdings Group