MTM® 46

MTM46 is a high performance, 135°C (275°F) curing, toughened epoxy resin formulated for the production of aircraft structures (FAR23 aircraft and unmanned air vehicles (UAVs). MTM46 exhibits excellent retention of Tg under wet conditions.

MTM46 can be processed via low pressure vacuum-bag Out-of-Autoclave (OoA) moulding or autoclave moulding.

MTM46 can be cured at temperatures as low as 80°C (176°F), allowing the use of low cost tooling for prototypes and short production runs.

MTM46 meets NASA outgassing requirements and can be used in space structures.

Features and Benefits

- 60 days out life at 21°C (70°F)
- 12 months storage at -18°C (0°F)
- 80 to 180°C (176 to 356°F) initial cure
- Meets NASA outgassing standards when tested to ECSS-Q-ST-70-02C
- Excellent tack and drape characteristics
- 140°C (284°F) dry Tg, 120°C (248°F) wet Tg following 135°C (275°F) cure
- 190°C (374°F) dry Tg , 130°C (266°F) wet Tg following 180°C (356°F) post-cure

RELATED DOCUMENTS

- De-bulking guidelines (TDS1036)
- Oven vacuum bag processing lay-up and bagging guidelines (TDS1041)
- Autoclave processing lay-up and bagging guidelines (TDS1037)

RELATED PRODUCTS

- HTA240 adhesive film
- MTF246 surfacing film

CURE CYCLE

Oven vacuum bag cure

Vacuum bag pressure	Minimum of 980mbar (29"Hg)*
Ramp rate	1 to 2°C (1.8 to 3.6°F)/minute
Recommended cure cycle	90 minutes at 135°C (275°F)
Cool down	Maximum of 3°C (5.4°F)/minute to 60°C (140°F)

*This is the ideal vacuum level, however, it is recognised that it is not always possible to attain. If in doubt, please contact our technical support staff for advice.

Autoclave cure

Vacuum bag pressure	Minimum of 980mbar (29"Hg)*
Autoclave pressure	6.2bar (90psi)**
Ramp rate	1 to 2°C (1.8 to 3.6°F)/minute
Recommended cure cycle	90 minutes at 135°C (275°F)
Cool down	Maximum of 3°C (5.4°F)/minute to 60°C (140°F)

*This is the ideal vacuum level, however, it is recognised that it is not always possible to attain. If in doubt, please contact our technical support staff for advice.

**If producing sandwich panels, apply the maximum pressure allowable for the honeycomb type.

Alternative cure cycles

Parts require a minimum cure of 90 minutes at 135°C (275°F) to achieve an acceptable level of performance.

Temperature	Duration	Additional information
80°C (176°F)	5 hours	Will require post-cure
100°C (212°F)	2 hours	Will require post-cure
120°C (248°F)	1 hour	Will require post-cure
180°C (356°F)	1 hour	

Other lower temperature cure cycles may be used but parts must then be subjected to a minimum post-cure of 1 hour at 120°C (248°F) before carrying out any further processing or machining. Parts then require further post-cure before being put into service to ensure an acceptable level of mechanical performance is achieved.

POST-CURE

MTM46 will develop a high level of mechanical performance following a 135°C (275°F) cure, but can be post-cured up to 180°C (356°F) to achieve full mechanical properties.

Ramp rate	0.3°C (0.5°F)/minute
Post-cure cycle	1 hour at 180°C -0/+5°C (356°F -0/+9°F)*†
Cool down	Maximum of 3°C (5.4°F)/minute to 60°C (140°F)

* Temperature must be measured by the lagging thermocouple attached to the part.

† Higher post-cure temperatures can be used to achieve an increase in Tg.

Notes:

Parts may be loaded into a pre-heated oven or heated at 3°C (5.4°F)/minute to the initial cure temperature. Large components should be adequately supported to avoid distortion.

PHYSICAL PROPERTIES

Test	Sample/test conditions	Results
Cured resin density	90 minutes at 135°C (275°F)	1.25 g/cm^3
DMA E' onset Tg (MTM46/CF0304-40%)	5 hours at 80°C (176°F), dry	75°C (167°F)
	2 hours at 100°C (212°F), dry	110°C (230°F)
	1 hour at 120°C (248°F), dry	125°C (257°F)
	1 hour at 135°C (275°F), dry	140°C (284°F)
	1 hour at 180°C (356°F), dry	190°C (374°F)
	90 minutes at 135°C (275°F) + 1 hour at 180°C (356°F), dry	190°C (374°F)
	90 minutes at 135°C (275°F) + 1 hour at 180°C (356°F), wet*	130°C (266°F)
Outgassing** (MTM46/M55J 32%) Test Method ECSS-Q-ST-70-02C	Total mass loss (TML)	0.388%
	Recovered mass loss (RML)	0.080%
	Water vapour release (WVR)	0.308%
	Collected volatile condensable material (CVCM)	0.000%

*Wet – 14 days immersion in water at 70°C (158°F)

** Laminate cured for 2 hours at 120°C (248°F) + 1 hour at 180°C (356°F)

MECHANICAL PROPERTIES

Material: MTM46/CF0526A*-42%RW

Cure cycle: 90 minutes at 135°C (275°F), oven vacuum bag cure

Test	Test method	Units	Test temperature/conditions			
			-55°C (-67°F) dry	20°C (68F°) dry	80°C (176°F) dry	80°C (176°F) wet*
0° Tensile strength	ASTM D3039	MPa (ksi)	622 (90.2)	684 (99.2)	704 (102)	711 (103)
0° Tensile modulus		GPa (msi)	60.1 (8.71)	59.9 (8.68)	59.5 (8.63)	60.7 (8.80)
0° Compressive strength	ASTM D3410	MPa (ksi)	588 (85.2)	505 (73.2)	453 (65.7)	357 (51.7)
0° Compressive modulus		GPa (msi)	57.0 (8.27)	53.9 (7.81)	54.8 (7.94)	54.3 (7.87)
In-plane shear strength (IPSS)	ASTM D3518	MPa (ksi)	113 (16.4)	98.6 (14.3)	80.0 (11.6)	65.3 (9.47)
In-plane shear modulus (IPSM)		GPa (msi)	4.88 (0.71)	4.17 (0.61)	3.61 (0.52)	3.27 (0.48)
0° Interlaminar shear strength (ILSS)	ASTM D2344	MPa (ksi)	-	64.1 (9.30)	-	-

Data normalised to 49%Vf except for ILSS and IPSS & IPSM

*CF0526A is a 193 g/m^2 plain weave fabric with 3k HTS40 type fibres

Material: MTM46/GF0103*-38%RW

Cure cycle: 90 minutes at 135°C (275°F), oven vacuum bag cure

Test	Test method	Units	Test temperature/conditions			
			-55°C (-67°F) dry	20°C (68F°) dry	80°C (176°F) dry	80°C (176°F) wet*
0° Tensile strength	ASTM D3039	MPa (ksi)	493 (71.5)	409 (59.3)	268 (38.8)	358 (51.9)
0° Tensile modulus		GPa (msi)	24.1 (3.49)	23.0 (3.34)	20.6 (2.99)	21.7 (3.15)
0° Compressive strength	ASTM D3410	MPa (ksi)	571 (82.8)	480 (69.6)	432 (62.7)	341 (49.4)
In-plane shear strength (IPSS)	ASTM D3518	MPa (ksi)	157 (22.8)	122 (17.7)	97.9 (14.2)	78.6 (11.4)
In-plane shear modulus (IPSM)		GPa (msi)	5.10 (0.74)	4.13 (0.60)	3.51 (0.51)	2.55 (0.37)
0° Interlaminar shear strength (ILSS)	ASTM D2344	MPa (ksi)	-	57.2 (8.29)	-	-

Data normalised to 45%Vf except for ILSS and IPSS & IPSM

*GF0103 is a 295 g/m^2 8 harness satin fabric (7781 style) with E glass fibres

Material: MTM46/ HTS5631-150g/m^2-35%RW

Cure cycle: 90 minutes at 135°C (275°F), oven vacuum bag cure

Test	Test method	Units	Test temperature/conditions			
			-55°C (-67°F) dry	20°C (68F°) dry	80°C (176°F) dry	80°C (176°F) wet*
0° Tensile strength	ASTM D3039	MPa (ksi)	1531 (222)	1694 (246)	1771 (257)	1707 (248)
0° Tensile modulus		GPa (msi)	124 (18.0)	127 (18.4)	134 (19.4)	125 (18.1)
0° Compressive strength	ASTM D3410	MPa (ksi)	1346 (195)	1101 (160)	1042 (151)	950 (138)
0° Compressive modulus		MPa (ksi)	115 (16.7)	114 (16.6)	115 (16.7)	110 (15.9)
In-plane shear strength (IPSS)	ASTM D3518	MPa (ksi)	120 (17.4)	119.31 (17.3)	100.68 (14.6)	81.37 (11.8)
In-plane shear modulus (IPSM)		GPa (msi)	4.62 (0.67)	3.65 (0.53)	3.31 (0.48)	3.93 (0.57)
0° Interlaminar shear strength (ILSS)	ASTM D2344	MPa (ksi)	-	87.58 (12.7)	-	-

Data normalised to 57%Vf except for ILSS and IPSS & IPSM

AVAILABILITY

MTM46 is available as a fabric prepreg, unidirectional prepreg or slit tape.

STORAGE

Out life* at 21°C (70°F)	60 days
Storage at -18°C (0°F)	12 months from date of manufacture

*Out life refers to accumulated time out of the freezer before the part is cured.

Note:
The actual freezer storage life, tack life and out life are dependent on a number of factors, including; fibre type, format and application. For certain formats, it may be possible for the storage life, tack life and out life to be longer than stated. Please contact our technical support staff for advice.

EXOTHERM

MTM® 46 prepregs are reactive formulations which can undergo severe exothermic heat up during the initial curing process if incorrect curing procedures are followed.

Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are adhered to, especially when moulding solid laminates in excess of 10mm (0.4in) thickness. The risk of exotherm increases with lay- up thickness and increasing cure temperature. It is strongly recommended that trials, representative of all the relevant circumstances, are carried out by the user to allow a safe cure cycle to be specified. It is also important to recognise that the model or tool material and its thermal mass, combined with the insulating effect of breather/bagging materials can affect the risk of exotherm in particular cases.

HEALTH & SAFETY

Please refer to the product SDS for safe handling, personal protective equipment recommendations and disposal considerations.