# 4035

NEWPORT HIGH PERFORMANCE MATERIALS

## 250-300°F (120-150°C) FST Epoxy Resin System

### Typical applications
Aerospace
Aircraft interiors

### Shelf life
6 months at 40°F (4°C)
12 months at 0°F (-18°C)

### Out life
30 days at 70°F (21°C)

## Description
4035 is a 250°F (120°C) to 300°F (150°C) cure, toughened, epoxy resin system designed for use in applications requiring a high level of flame retardancy. With no odor and VOC-free processing, it is an ideal replacement for traditional phenolic systems. 4035 maintains mechanical properties in the same range as traditional epoxy systems, a limitation of most flame retardant thermoset polymers available.

## Benefits/features
- Flame retardant with low heat release rate and smoke density
- Snap cure capable
- Long out time
- Excellent mechanical properties
- Both laminates and sandwich panels meet:
  - ✓ FAR 25.853 Appendix F, Part I (a)(1)(i) flammability requirement - vertical 60 second
  - ✓ FAR 25.855 Appendix F, Part I (a)(2)(ii) flammability requirement - 45 degree 30 second (F5 test)
  - ✓ FAR 25.853 Appendix F, Part IV heat release requirements
  - ✓ FAR 25.853 Appendix F, Part V smoke emission requirements

## Application
4035 is suitable for a wide range of flame retardant applications, and is specifically formulated for aircraft interior applications, where flame retardancy, smoke density, and heat release requirements must be met.

4035 can be supplied with most commercially available fibers (carbon, quartz, aramid, S-glass, E-glass, etc.) in both woven form (designated as NB) as well as 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 140 –300 gsm 0.014 –0.060 psf).

## Recommended processing conditions
4035 can be snap cured by press at 250°F (120°C) for 20 minutes or 275°F (135°C) for 10 minutes. It also can be cured with autoclave or OOA (out of autoclave) at temperatures ranging from 250°F (120°C) to 300°F (150°C), depending on part size and complexity. Low, medium, and high pressure molding techniques may be used for curing. Recommended autoclave 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).

Contact your account manager or MCCFC technical support to discuss specific applications.

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 | 2-3 |
| Specific gravity | 1.60 |
| $T_g$ (DMA, E'), °F (°C) | 314 (157) |

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

### 7781 E-GLASS FABRIC

42%RC, snap cured [10 min at 275°F, 25 psi] & OOA cured [60 min at 275°F, 60 psi], results as tested

| Property | Test method | Snap cured 10 min @ 275°F) | OOA cured (60 min @ 275°F) |
|---|---|---|---|
| 0° Tensile strength, ksi (MPa) | ASTM D3039 | 74 (510) | 71.9 (496) |
| 0° Tensile modulus, Msi (GPa) | | 4.03 (27.7) | 3.72 (25.6) |
| Poisson's ratio | | 0.16 | 0.15 |
| 0° Compressive strength, ksi (MPa) | ASTM D695 mod | 80.7 (556) | 81.2 (559) |
| 0° Compressive modulus, Msi (GPa) | | 4.17 (28.7) | 3.90 (26.9) |
| 0° Flexural strength, ksi (MPa) | ASTM D790 | 97 (670) | 103 (710) |
| 0° Flexural modulus, Msi (GPa) | | 3.40 (23.4) | 3.38 (23.3) |
| Short beam shear strength, ksi ( MPa) | ASTM D2344 | 9.0 (62) | 10.1 (69.6) |
| Long beam flex ultimate strength, ksi (Mpa)* | ASTM D7249 | 49.7 (343) | - |
| Flatwise tensile, psi (Mpa)* | ASTM D297 | 328 (2.26) | - |

*Testing done on sandwich panel

| FAR 25.853 Appendix F | | | |
|---|---|---|---|
| Part I a1i and a2iii | | | |
| 60-Second vertical flame test | Requirements | Snap cure | OOA cure |
| Self-extinguish, time after flame removal | 15 sec. max | 0 sec. | 0 sec. |
| Average burn length | 6" max | 3.3" | 3.4" |
| Self-extinguish drip time | 3 sec. max | 0 sec. | 0 sec. |
| Part IV (OSU Heat release rate) | | | |
| Results at various thicknesses | Requirements | Snap cure | OOA cure |
| Heat release rate @2 min. (kW-min/$m^2$) | 65 max | 30.7 | 26.5 |
| Peak heat release rate (kW/$m^2$) | 65 max | 35.5 | 30.7 |
| Time to peak heat (sec) | n/a | 21.0 | 23.0 |
| Part V (Smoke emission) | | | |
| Results | Requirements | Snap cure | OOA cure |
| 4 minutes, optical density (D max) | 200 max. | 99.2 | 127 |

| Toxicity data (Boeing Doc No. D6-513777) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Test method | CO | HCN | HF | HCl | $SO_2$ | $NO_x$ |
| Snap cure, ppm | BSS 7239 Rev. A | 155 | 10 | <5 | <5 | <5 | 30 |
| OOA cured, ppm | | 122 | 9 | <5 | <5 | <5 | 29 |
| Max. allowed, ppm | | 3500 | 150 | 200 | 500 | 100 | 100 |

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## 34-700 CARBON UNITAPE

36%RC, 150 gsm, snap cured [10 minutes at 275°F, 25 psi]

| Property | Test method | Result as tested | Normalized to 60% FV |
|---|---|---|---|
| 0° Tensile strength, ksi (MPa) | ASTM D3039 | 351 (2420) | 356 (2450) |
| 0° Tensile modulus, Msi (GPa) | | 19.5 (134) | 19.8 (137) |
| Poisson's ratio | | 0.28 | |
| 90° Tensile strength, ksi (MPa) | ASTM D3039 | 8.8 (61) | - |
| 90° Tensile modulus, Msi (GPa) | | 1.47 (10.1) | - |
| 0° Compressive strength, ksi (MPa) | ASTM D695 mod | 229 (1580) | 233 (1610) |
| 0° Compressive modulus, Msi (GPa) | | 18.6 (128) | 18.9 (130) |
| 90° Compressive strength, ksi (MPa) | ASTM D695 mod | 33.3 (230) | - |
| 90° Compressive modulus, Msi (GPa) | | 1.42 (9.79) | - |
| 0° Flexural strength, ksi (MPa) | ASTM D790 | 238 (1640) | 242 (1670) |
| 0° Flexural modulus, Msi (GPa) | | 18.7 (129) | 19.0 (131) |
| Short beam shear strength, ksi ( MPa) | ASTM D2344 | 10.8 (74.5) | - |
| ±45°IPS Strength @0.2% offset, ksi (MPa) | ASTM D3518 | 7.05 (48.6) | - |
| ±45°IPS Strength @5% shear strain, ksi (Mpa) | | 10.1 (69.6) | - |
| ±45°IPS Modulus, Msi (GPa) | | 0.68 (4.69) | - |

| FAR 25.853 Appendix F | | |
|---|---|---|
| Part I a1i and a2iii | | |
| 60-Second vertical flame test | Requirements | Results |
| Self-extinguish, time after flame removal | 15 sec. max | 0 sec. |
| Average burn length | 6" max | 3.4" |
| Self-extinguish drip time | 3 sec. max | 0 sec. |
| Part IV (OSU Heat release rate) | | |
| Property | Requirements | Results |
| Heat release rate @2 min. (kW-min/m$^2$) | 65 max | 29.8 |
| Peak heat release rate (kW/m$^2$) | 65 max | 29.7 |
| Time to peak heat (sec) | n/a | 44.0 |
| Part V (Smoke emission) | | |
| Property | Requirements | Results |
| 4 minutes, optical density (D max) | 200 max. | 59.7 |

| Toxicity data (Boeing Doc No. D6-513777) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Test method | CO | HCN | HF | HCl | $SO_2$ | $NO_x$ |
| Snap cure, ppm | BSS 7239 Rev. A | 122 | 9 | <5 | <5 | <5 | 29 |
| Max. allowed, ppm | | 3500 | 150 | 200 | 500 | 100 | 100 |

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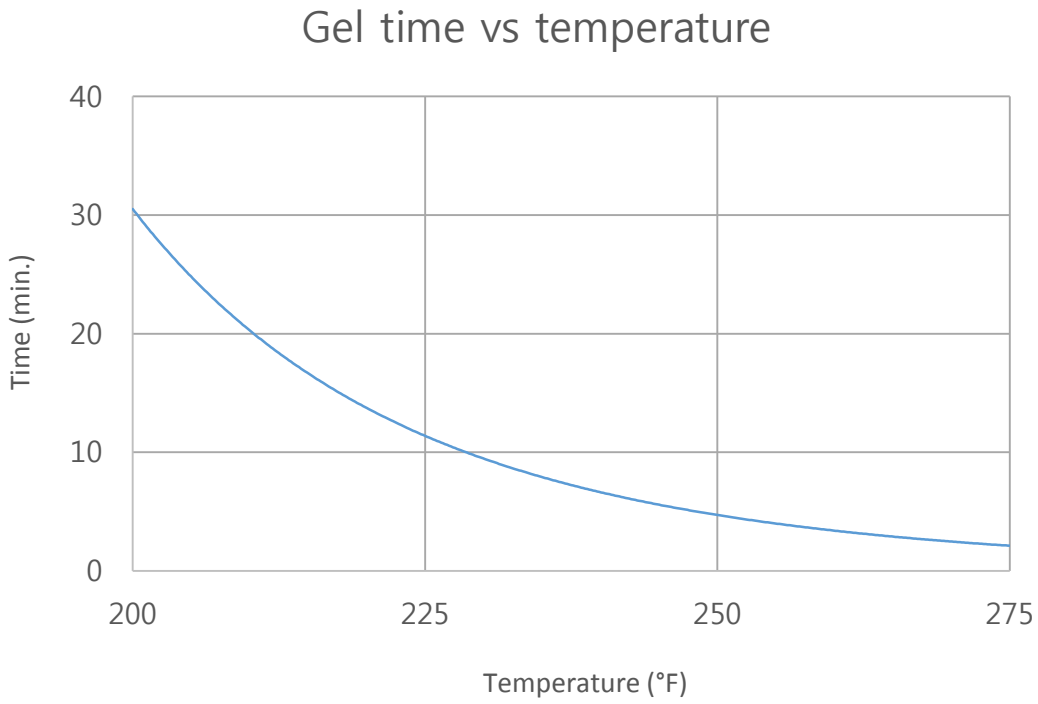
## TR30S 3K 2x2 TWILL CARBON FABRIC

42%RC, snap cured [10 minutes at 275°F, 60 psi], results as tested

| Property | Test method | RT |
|---|---|---|
| 0° Tensile strength, ksi (MPa) | ASTM D3039 | 118 (814) |
| 0° Tensile modulus, Msi (GPa) | | 8.54 (58.9) |
| Poisson's ratio | | 0.04 |
| 0° Compressive strength, ksi (MPa) | ASTM D695 mod | 100 (689) |
| 0° Compressive modulus, Msi (GPa) | | 7.71 (53.2) |
| 0° Flexural strength, ksi (MPa) | ASTM D790 | 124 (855) |
| 0° Flexural modulus, Msi (GPa) | | 7.52 (51.8) |
| Short beam shear strength, ksi ( MPa) | ASTM D2344 | 10.5 (72.4) |
| ±45°IPS Strength @0.2% strain, ksi (MPa) | ASTM D3518 | 7.50 (52) |
| ±45°IPS Strength @5% strain, ksi (Mpa) | | 11.2 (77) |
| ±45°IPS Modulus, Msi (GPa) | | 0.65 (4.48) |

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