

### F-555 Phenolic Prepregs

Park's F-555 is a carbon-filled MIL-R-9299 phenolic resin optimized for coating Carbonized Rayon cloth. F-555 is used extensively in the manufacture of high temperature rocket nozzles, heat shields, and combustion chambers.

#### Key Features & Benefits

- Provides a combination of high-strength and ablative properties for demanding applications
- Low thermal expansion
- Good Tack and Drape properties

#### Product Forms

- Available on a wide variety of reinforcements, including C2B / C2B NG, NARC, CYDA and Acordis ENKA
- Available as Broadgoods, Bias Tape and Chopped Molding Compound
- Solution coated fabrics up to 152 cm wide
- Compatible with Autoclave or Press Molding processes

#### Applications / Qualifications

- Rocket Nozzles
- Combustion Chambers
- Heat Shields
- Rocket Motor Throat Sections

#### For Information about Park's materials:

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### F-555 Phenolic Prepregs

#### Prepreg Physical Properties

| Reinforcement                    | C2B /<br>C2B NG | ENKA    | NARC /<br>CYDSA ** | Glass   | 12kTW                | 3K8HS<br>T300 |
|----------------------------------|-----------------|---------|--------------------|---------|----------------------|---------------|
| Fabric Area Weight (gsm)         | 330             | 280     | 270                | 610     | 670                  | 370           |
| Prepreg Resin Content (%)        | 31 – 37         | 31 – 37 | 31 – 37            | 28 – 34 | 39 – 45              | 32 -38        |
| Resin Flow (163°C, 1034 kPa) (%) | 5 – 20          | 5 – 20  | 5 – 25             | --      | 10 – 20 <sup>1</sup> | 10-25         |
| Volatiles (163°C, 5 min) (%)     | 2 – 5           | 2 – 5   | 2 - 8              | 2-5     | <4                   | 2-8           |
| Filler Content (%)               | 9 -15           | 9 – 15  | 8 -16              | --      | --                   | 9-16          |

\*\* Typical Values for carbonized rayon fabric

<sup>1</sup> 344 kPa

#### Cured Laminate Physical Properties

| Reinforcement  | C2B /<br>C2B NG | ENKA | NARC /<br>CYDSA ** | C2B /<br>C2B NG | Glass                    | T300  |
|--|-----------------|------|--------------------|-----------------|--------------------------|-------|
| Product Form   | 8HS             | 8HS  | 8HS                | CMC             | 18oz.<br>Woven<br>Roving | 3K8HS |
| Per Ply Thickness (mm)   | 0.48            | 0.38 | 0.41               | --              | 0.51                     | 0.43  |
| Specific Gravity<br><small>ASTM-D-792</small>                                    | 1.37            | 1.47 | 1.45               | 1.47            | 2.08                     | 1.48  |
| Hardness (Barcol)<br><small>ASTM-D-2583</small>                                  | 75              | 75   | 75                 | 81              | 68                       | --    |
| Specific Heat (J/g°C)<br><small>ASTM-C-351</small>                               | 8.9             | 2.1  | 1.17               | --              | --                       | --    |
| CTE – with-ply 27 - 204°C<br>(ppm/°C) <small>ASTM-D-696</small>                  | 15.5            | 7.2  | 7.2                | --              | --                       | --    |
| CTE – x-ply 27 – 204°C<br>(ppm/°C) <small>ASTM-D-696</small>                     | --              | 12.2 | 12.2               | --              | --                       | --    |
| Thermal Conductivity<br>with-ply @ 149°C (J/s m °C)<br><small>ASTM-C-177</small> | --              | --   | 1.59               | --              | --                       | --    |
| Thermal Conductivity<br>x-ply @ 149°C (J/s m °C)<br><small>ASTM-C-177</small>    | --              | 0.87 | 1.02               | --              | --                       | --    |

\*\* Typical Values for carbonized rayon fabric

All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a Park representative directly. Park reserves the right to change these values based on a nature process of refining our testing equipment and techniques.

### F-555 Phenolic Prepregs

#### Laminate Mechanical Properties

| Reinforcement  | C2B /<br>C2B NG | ENKA | NARC /<br>CYDSA ** | C2B /<br>C2B NG | Glass                 | T300  |
|--|-----------------|------|--------------------|-----------------|-----------------------|-------|
| Product Form   | 8HS             | 8HS  | 8HS                | CMC             | 18oz.<br>Woven Roving | 3K8HS |
| Tensile Strength, 0° (MPa)<br>24°C Dry<br>ASTM-D-638 | 241             | 145  | 179                | 48              | 352                   | 544   |
| Tensile Modulus, 0° (GPa)<br>24°C Dry<br>ASTM-D-638  | 15.9            | 17.2 | 16.5               | 17.2            | 29                    | 53.7  |
| Compressive Strength (MPa)<br>24°C Dry<br>ASTM-D-695 | 317             | 379  | 317                | 290             | 152                   | 268   |
| Compressive Modulus (GPa)<br>24°C Dry<br>ASTM-D-695  | 22.1            | 19.3 | 15.2               | 16.5            | 4.7                   | 47.5  |
| Flexural Strength (MPa)<br>24°C Dry<br>ASTM-D-790    | 448             | 269  | 228                | 138             | 32.4                  | --    |
| Flexural Modulus (GPa)<br>24°C Dry<br>ASTM-D-790     | 15.9            | 19.3 | 16.5               | 17.2            | 23.4                  | --    |
| Short Beam Shear (MPa)<br>24°C Dry<br>ASTM-D-5379    | 30.3            | 35.2 | --                 | 30.3            | --                    | 35.9  |

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### F-555 Phenolic Prepregs

#### Prepreg Storage Life

- Out Life: 30 days @ 24°C
- Shelf Life: 6 months @ 4°C

Note: The following guidelines are provided to assist Park material users with general recommendations for successful processing. The recommendations are for general review purposes only and process adjustments may be required to achieve optimum results in your specific manufacturing environment.

#### Autoclave Cure Cycle

- Apply 610 mm Hg vacuum (minimum) for 1 hour before beginning heat cycle
- Raise temperature from RT to 93°C at 1 - 3°C/min
- Hold product at 93°C for 30 minutes
- Increase autoclave pressure to 690 kPa and vent vacuum at 103 – 138 kPa
- Raise product temperature to 177 ± 3°C at 1 - 3°C/min
- Hold product at cure temperature for 60 – 90 minutes
- Cool to 66°C at no more than 3°C/min prior to releasing autoclave pressure
- Post Cure:
  - o Heat Oven at 1 – 5 °C /min to 177°C and hold 2 hours
  - o Heat oven to 204°C and hold 4 hours

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