



Document No.: NMS 451/6, Revision A, April 22, 2024

NCAMP Material Specification

This specification is generated and maintained in accordance with NCAMP Standard Operating Procedures, NSP 100

Medium Temperature, Out-of-Autoclave, Oven-Vacuum-Bag Cure Epoxy Resin Impregnated Fiber Reinforced Composite Materials, Type 32, Class 1, Grade 145 (Solvay (formerly Cytec & Advanced Composites Group) MTM45-1 IM7 Tape)

Prepared by: Michelle Man, Vinsensius Tanoto, Yeow Ng, John Tomblin

Reviewed by: Royal Lovingfoss (NCAMP), Dusty Penn (Cytec), Chris Ridgard (Solvay), Danny Wienecke (Cytec), Chad Duplantis (Cytec), Steve Markham (Cytec), Gene Spinks (Solvay), Clay Scoggins (Solvay)

The specification is intended for general distribution to the public, either freely or at a price that does not exceed the cost of reproduction (e.g. printing) and distribution (e.g. postage).

National Center for Advanced Materials Performance
Wichita State University – NIAR
1845 Fairmount Ave., Wichita, KS 67260-0093, USA

1. SCOPE:

1.1 Form:

This detail specification along with the base specification NMS 451 establishes the requirements for continuous unidirectional carbon fiber impregnated with a modified B-staged epoxy resin (“unidirectional tape prepreg”). The prepreg is produced using a hot-melt process.

This detail specification follows the section and table numbering scheme of the base specification. It contains additiona

- (1) Specific procedures should be identical to those used in the original material qualification program.
- (2) Three specimens should be taken across the width of the prepreg; left, center, right.
- (3) "ind." refers to individual measurements. "avg" refers to the average measurements per roll. / L P L W V F R P S X W H G D W . D Q G P R G L I L H G & 9
- (4) Optional to perform HPLC and/or FTIR; Two specimens should be tested per sampled roll.

3.2 Constituent Material Requirements:

3.2.2 Reinforcement: Efforts to qualify the carbon fiber to NCAMP carbon fiber material specification, NMS 818, are ongoing. In the meantime, Solvay will continue to provide aerospace-grade carbon fiber for this prepreg per the prepregger's carbon fiber procurement specification and Solvay's internal aerospace-grade PCD. In addition, the following change control is implemented on the carbon fiber:

The carbon fiber tow product manufacturer shall establish control factors which will yield

1. d ()Tj EMC i) bbF7C38e(a[(10 d 1.(-28.5)- (t)nuaer) aer)76 0.o7o aere Td [(- pd 1.(al)6 (.9 (s

3.5 Laminate (Cured Prepreg) Requirements:

3.5.2 Cured Laminate Physical Properties:

TABLE 3 - Cured Laminate Physical Properties

Property	Test Method ⁽¹⁾	Requirements ⁽²⁾
Cured Ply Thickness ⁽³⁾	SACMA SRM 10R-94	0.00521 and 0.00588 inch, avg.
Dry Glass Transition Temperature, Tg by DMA	SACMA SRM 18R-94	332.2 and 382.5 °F, ind.

⁽¹⁾ Specific procedures should be identical to those used in the original material qualification program.

⁽²⁾ "ind." refers to individual measurements. "avg." refers to the average measurements per panel.

⁽³⁾ Computed from actual qualification panel thicknesses and theoretical nominal CPT.
/ L P L W V F R P S X W H G D W . D Q G P R G L I L H G & 9

3.5.3 Cured Laminate Mechanical Properties:

TABLE 4 - Required Cured Laminate Tests for Mechanical Properties (Class 1)

Property	Test Method ⁽¹⁾	Requirements ⁽³⁾
0/90° Tension Strength and Modulus, Room Temperature Dry Layup: [0/90] _{4S}	ASTM D3039	Strength ⁽²⁾ : Min. Ind. • 145.50 ksi Strength ⁽²⁾ : Average • 168.10 ksi Modulus ⁽²⁾ : 10.6 and 12.6 msi, avg.
90/0° Compression Strength, Room Temperature Dry Layup: [90/0] _{4S}	ASTM D6641	Strength ⁽²⁾ : Min. Ind. • 69.98 ksi Strength ⁽²⁾ : Average • 88.61 ksi, avg.
0° Short Beam Strength, Room Temperature Dry Layup: [0] ₁₆	ASTM D2344	Strength: Min. Ind. • 11.80 ksi Strength: Average • 13.47 ksi

⁽¹⁾ Specific procedures should be identical to those used in the original material qualification program.

⁽²⁾ Normalize the properties to a nominal cured ply thickness (CPT) value of 0.0055 inch based on theoretical nominal CPT, using the following equation:
Normalized_Value = Measured_Value x Measured_CPT / Nominal_CPT.

⁽³⁾ "ind." refers to individual measurements. "avg" refers to the average of 5 replicates.
/ L P L W V F R P S X W H G D W . D Q G P R G L I L H G & 9

