

Composite Characterization

Characterization approach from NCAMP

Compare to Cytec Cycom 5215 3K70PW fabric with T650 (38% resin content by weight)

ASTM	Test description	Ply Schedule	Condition(s)
C297	Flatwise tensile	[0/90]4, core, (0/90)4]	RTD, ETW
D2344	Short beam shear	[0/90]32	RTD, ETW
D3039	Tension	[0/90]15	CTD, RTD, ETW
D3518	In-plane shear	[+/-45]8	CTD, RTD, ETW
D5766	Open hole tension	[(+/-45),(0/90)]4s	CTD, RTD, ETW
D6484	Open hole compression	[(+/-45),(0/90)]5s	RTD, ETW
D6641	Compression (CLC)	[0/90]15	RTD, ETD, ETW
D7136/D7137	Compression after impact	[(+/-45),(0/90)]5s	RTD

RT: Room temperature (70°F [21.1°C])

CT: Cold temperature (-65°F [53.9°C])

ET: Elevated Temperature (180°F [82.2°C])

W: Water boil

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ASTM 3518 In-Plane Shear [± 45]₈ SGP193-P fabric

Condition	Material	Shear Modulus		Shear strength at 5% strain		Shear strength at offset	
		Mean, GPa	COV	Mean, MPa	COV	Mean, MPa	COV
CTD	NONA-001	6.42	5.72	98.1	6.00	70.3	3.71
	Cycom 5215	4.69	1.71	87.8	1.90	59.4	2.01
RTD	NONA-001	4.78	2.86	73.0	7.40	42.6	2.87
	Cycom 5215	3.93	1.58	N/A	N/A	42.3	1.48
ETW	NONA-001*	3.12	5.90	47.0	5.76	22.2	5.56
	Cycom 5215	2.69	4.10	41.4	4.07	24.9	4.37

* 1.50%wt gain – 48 hour water boil

ASTM 2344 Short Beam Strength [0/90]₁₃₂ SGP193-P

Condition	Material	Shear Strength	
		Mean, MPa	COV
RTD	NONA-001	58.1	2.42
	Cycom 5215	64.8	2.47
ETW	NONA-001*	44.6	1.84
	Cycom 5215	43.3	1.79

* 0.55%wt gain – 48 hour water boil

Take Away: **NONA process achieves comparable thermal and mechanical performance to conventional OoA systems**

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		CTD			RTD			ETW		
OHT Strength		ksi	MPa	C.V. (%)	ksi	MPa	C.V. (%)	ksi	MPa	C.V. (%)
	NONA-001*	42.1	290.6	3.71	46.8	322.6	2.36	51.9	357.7	1.88
	Cycom 5215**	43.4	299.3	2.76	44.9	309.5	2.87	49.7	342.6	1.92

* NONA-001 / SGP193-P, [(±45)/(0/90)]4s, resin content (RC) = 39.31%wt

**Cycom 5215 / T650 3K70PW, [45/0/-45/90]2s. RC = 38.46%wt

		RTD			ETW		
OHC Strength		ksi	MPa	C.V. (%)	ksi	MPa	C.V. (%)
	NONA-001*	43.1	297.2	3.72	27.5	189.3	5.11
	Cycom 5215**	40.4	278.6	2.42	31.2	215.2	4.23

* NONA-001 / SGP193-P, [(±45)/(0/90)]5s, RC = 40.03%wt

**Cycom 5215 / T650 3K70PW, [45/0/-45/90/45/0/-45/90/-45/90]s. RC = 37.83%wt

CAI Strength, RTD	Material	ksi	MPa	C.V. (%)
	NONA-001*	26.7	184.1	3.22
	Cycom 5215**	27.1	187.2	3.67

* NONA-001 / SGP193-P, [(±45)/(0/90)]5s, RC = 39.52%wt

**Cycom 5215 / T650 3K70PW, [45/0/-45/90]3s. RC = 38.95%wt