



CTD-101K Epoxy Resin System

High Performance Resins for Cryogenic and Radiation Applications

- An anhydride cured epoxy system that was developed and tested for cryogenic applications down to liquid helium temperatures (-269°C/-452°F) as well as for its resistance to high energy radiation.
- Sets the performance standards in cryogenic and high radiation applications and is backed by performance data that meet all applicable test specifications.
- Good room temperature performance and handling characteristics: low viscosity and long pot-life.
- Non-carcinogenic resin system with very low toxicity. It is a non-solvent based system, and will not give off volatiles on cure.
- Improved wetting and excellent impregnation of large coils with highly tortuous paths.

- CURE OPTIONS:**
1. 5 hours at 110°C; Post Cure 16 hours at 125°C
 2. 5 hours at 110°C; Post Cure 1.5 hours at 135°C
 3. 24 hours at 80°C; Post Cure 1.5 hours at 135°C

Process Compatibilities	Material Advantages
<ul style="list-style-type: none"> • Filament winding (FW) • Resin Transfer Molding (RTM) • Vacuum Pressure Impregnation (VPI) • Casting with or without filler 	<ul style="list-style-type: none"> • Non-Carcinogenic • Low Toxicity • Long Pot-Life, 60 hours at 40° C • Low Viscosity, 400 cP at 40° C • Excellent adhesion to fibers and fillers • Specific Gravity 1.03 g/cc • Processing Temperature 40 - 60° C

Material Properties

Viscosity @ 60° C [cP]	Glass Transition Temp [°C]	Linear Shrinkage* [%]	Dielectric Strength with S-2 Glass, 0.5 mm thick, at 76 K [KV/mm]
<100	113°	<1	76.3

*Neat resin linear cure shrinkage, cured 1.5 hrs at 135° C. Cure schedule will effect linear shrinkage.

CTD-101K, with 50% V_f satin weave S-2 Glass, Through Thickness: Unirradiated Compressive Properties

Temperature [K]	Compression Strength [MPa]	Compression Modulus [GPa]
295	790	12.9
76	1300	16.7
4	1360	19.7



Shear Properties

Temperature [K]	Shear Strength [MPa]	Flexural Modulus [GPa]
76	108.0	27.9
4	120.0	34.1

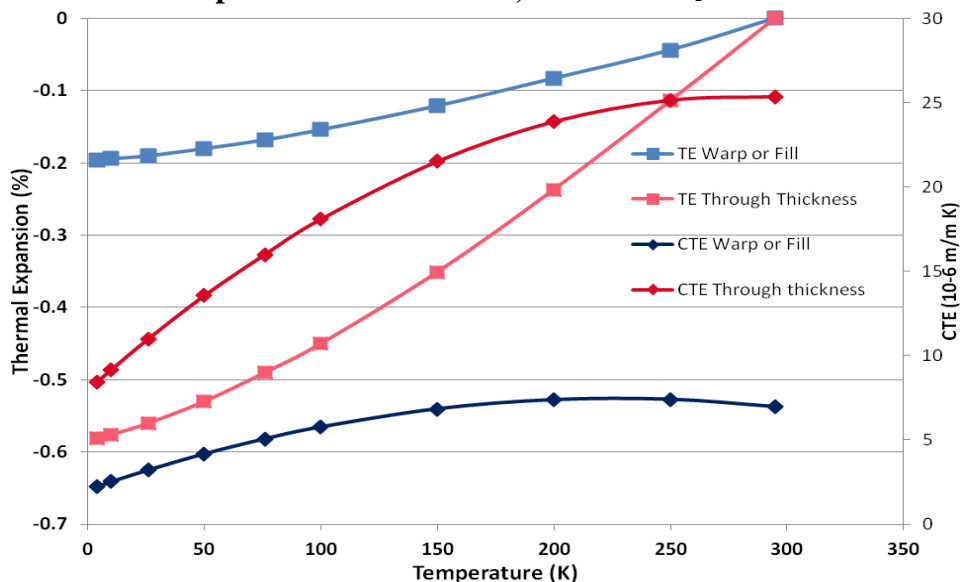
Combined Shear/Compressive Properties

Temperature [K]	Fixture [deg.]	Shear Strength [MPa]	Compressive Strength [MPa]
76	15	101.5	29.6
76	45	175.8	175.8
76	75	247.5	933.2
76	84	127.1	1207.7
4	15	104.1	27.9
4	45	178.3	178.3
4	75	277.2	1034.3
4	84	125.0	1197.3

Irradiation Results

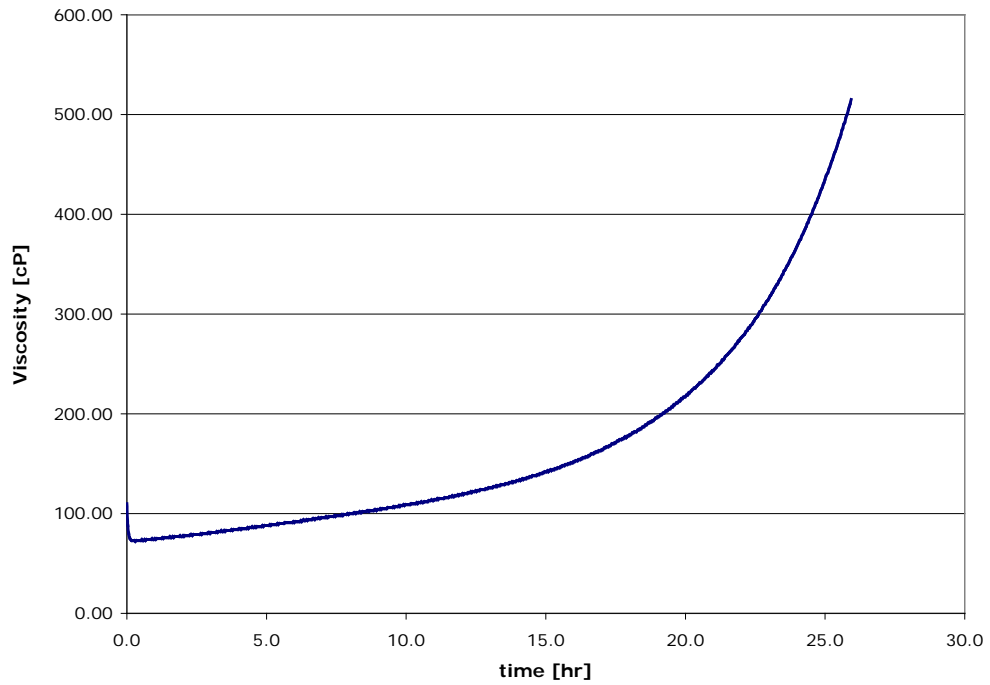
Irradiation Temp [K]	Dose [Rads]	Compressive Strength at 76K [GPa]	Compressive Modulus at 76K [GPa]	Shear Strength at 76K [MPa]	Flexural Modulus at 76K [GPa]	Fracture Resistance G_{1C} at 76K [KN/m]
4	4.7E9	1.23	19.5	85.0	27.5	-
4	8.8E9	1.20	13.0	41.3	20.6	-
4	1.6E10	1.08	13.5	6.7	15.6	-
330	-	1.30	16.7	108.0	27.9	0.36
330	4.7E8	-	-	-	-	0.28
330	4.7E9	-	-	-	-	0.15
330	2.3E10	-	-	-	-	0.16

Coefficient of Thermal Expansion of CTD-101K, with 50% V_f satin weave S-2TM Glass





Viscosity Profile of CTD-101K at 60°C



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