

Antero 840CN03



FDM Thermoplastic Filament
Electrostatic dissipative
PEKK-based thermoplastic.

The information presented are typical values intended for reference and comparison purposes only.
They should not be used for design specifications or quality control purposes.



Overview

Antero™ 840CN03 is a PEKK-based FDM thermoplastic combining the excellent physical and mechanical qualities of PEKK with electrostatic dissipative (ESD) properties. The material is filled 3% by weight with carbon nanotubes.

As a high-performance polymer, Antero 840CN03 exhibits exceptional chemical and wear resistance, ultra-low outgassing properties and consistent ESD performance. ESD values range from $10^4 - 10^9$ ohms per square inch. This makes the material particularly suitable for space and industrial applications where these qualities are critical.

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Ordering Information

3D Printer Compatibility

F900™

T20D tip

T16 tip (support only)

Support Material

SUP8000B™ breakaway support system (BASS)

Build Sheets

High temperature

.02 x 16 x 18.5 in. (0.76 x 406 x 470 mm)

.02 x 26 x 38 in. (0.76 x 660 x 965 mm)

Table 1. Antero 840CN03 Thermoplastic Filament Ordering Information

Part Number	Description
Filament Canisters	
355-02510	Antero 840CN03, 92.3 cu in – Plus
355-03260	SUP8000B, 92.3 cu in – Plus
Printer Consumables	
511-10730-S	T20D tip, 0.010 in. (0.254 mm) layer height
511-10401	T16 tip, 0.010 in. (0.254 mm) layer height
325-00275-S	High Temperature build sheet, 0.02 x 26 x 38 in (0.76 x 660 x 965 mm)
325-00475-S	High Temperature build sheet, 0.02 x 16 x 18.5 in (0.76 x 406 x 470 mm)

Physical Properties

Values are measured as printed. XY, XZ, and ZX orientations were tested.

For full details refer to the [Stratasys Materials Test Procedure on www.stratasys.com](http://www.stratasys.com).

DSC and TMA curves can be found in the Appendix.

Table 2. Antero 840CN03 Thermoplastic Filament Physical Properties

Property	Test Method	Typical Values
HDT @ 66 psi	ASTM D648 Method B	150 °C (302 °F)
HDT @ 264 psi	ASTM D648 Method B	153 °C (306 °F)
Tg	ASTM D7426 Inflection Point	158 °C (316 °F)
Mean CTE	ASTM E831 (40 °C to 140 °C)	50 $\mu\text{m}/[\text{m}\cdot^{\circ}\text{C}]$ (28 $\mu\text{in}/[\text{in}\cdot^{\circ}\text{F}]$)
Volume Resistance ⁽¹⁾	ASTM D257	10^4 - 10^9 Ω
Specific Gravity	ASTM D792 @ 23 °C	1.27

(1) See ESD section

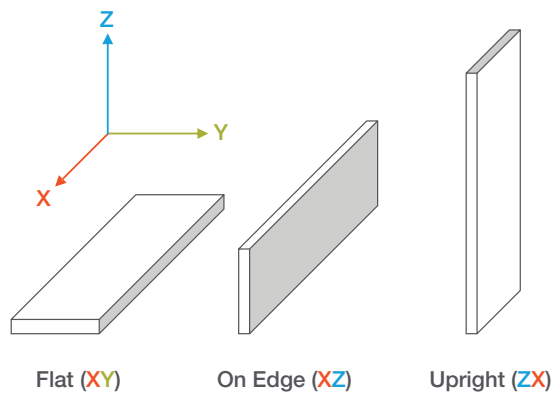
Mechanical Properties

Samples were printed with 0.010 in. (0.254 mm) layer height.

For the full test procedure please see the [Stratasys Materials Test Procedure on www.stratasys.com](http://www.stratasys.com).

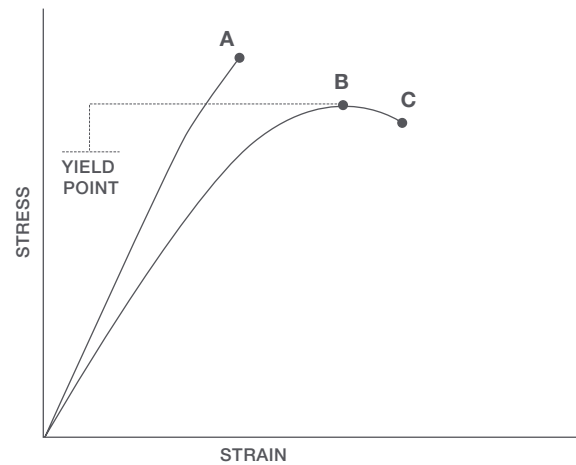
Print Orientation

Parts created using FDM are anisotropic as a result of the printing process. Below is a reference of the different orientations used to characterize the material.



Tensile Curves

Due to the anisotropic nature of FDM, tensile curves look different depending on orientation. Below is a guide of the two types of curves seen when printing tensile samples and what reported values mean.



- A = Tensile at break, elongation at break (no yield point)
- B = Tensile at yield, elongation at yield
- C = Tensile at break, elongation at break

Mechanical Properties

Table 3. Antero 840CN03 Thermoplastic Filament Mechanical Properties

		XZ Orientation ⁽¹⁾	ZX Orientation ⁽¹⁾
Tensile Properties: ASTM D638			
Yield Strength	MPa	95 (5)	No yield
	psi	13,610 (550)	No yield
Elongation @ Yield	%	4.4 (4)	No yield
Strength @ Break	MPa	65 (15)	50 (5)
	psi	9,150 (2330)	7,320 (600)
Elongation @ Break	%	6 (3)	1.8 (0.2)
Modulus (Elastic)	GPa	3.17 (0.04)	3.01 (0.06)
	ksi	460 (7)	435 (10)
Flexural Properties: ASTM D790, Procedure A			
Strength @ Break	MPa	No break	70 (10)
	psi	No break	9,760 (1580)
Strength @ 5% Strain	MPa	135 (3)	-
	psi	19,620 (380)	-
Strain @ Break	%	No break	2.4 (0.6)
Modulus	GPa	3.24 (0.05)	2.7 (0.1)
	ksi	470 (7)	390 (15)
Compression Properties: ASTM D695			
Yield Strength	MPa	100 (2)	105 (3)
	psi	14,920 (290)	15,380 (500)
Modulus	GPa	2.61 (0.04)	2.63 (0.04)
	ksi	380 (6)	380 (6)
Impact Properties: ASTM D256, ASTM D4812			
Izod, Notched	J/m	48 (4)	28 (8)
	ft*lb/in	0.90 (0.07)	0.5 (0.1)
Izod, Unnotched	J/m	1,470 (690)	128 (40)
	ft*lb/in	28 (13)	2.4 (0.8)

(1) Values in parentheses are standard deviations

ESD Properties

Antero 840CN03 was tested per ANSI ESD S20.20, S11.11, STM11.12 to determine the effect that build parameters and part geometries had on ESD properties. Different geometries printed in different orientations all fall into the ESD safe range (10^4 to 10^9 ohms). For full details, see the [Antero 840CN03 ESD White Paper](#).

Figure 1.4 x 4 x 0.1 in plaque resistance in various build orientations.

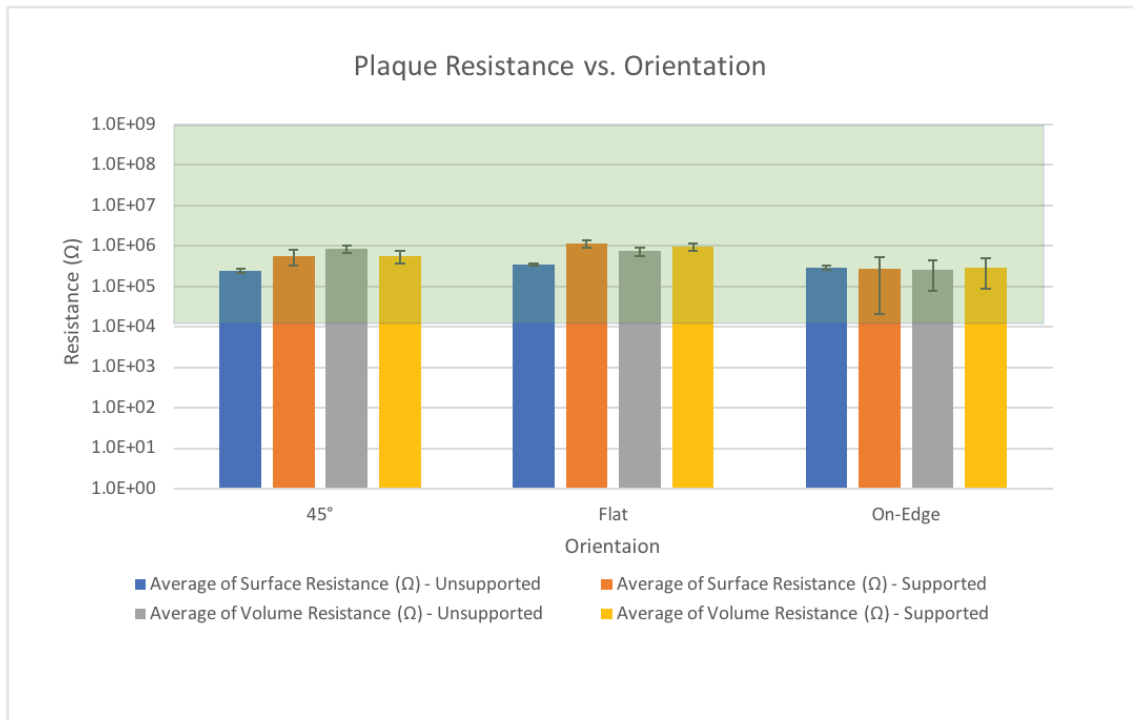
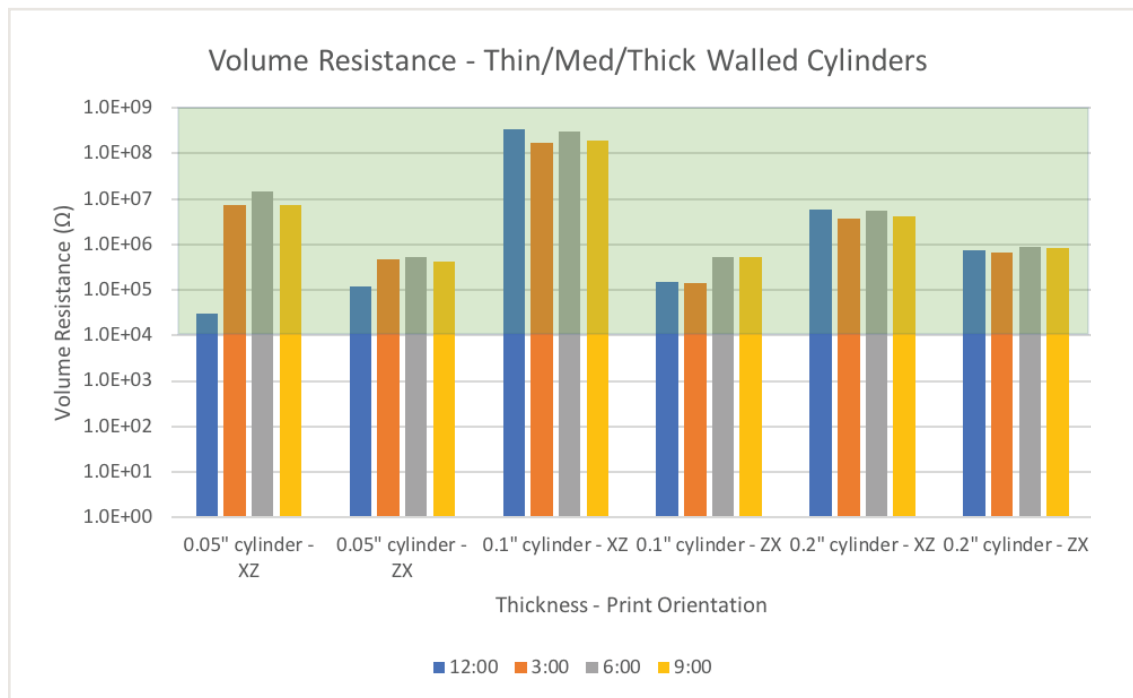


Figure 2. Volume resistance of hollow cylinders with respect to wall thickness, build orientation, and location on the cylinder.



Chemical Resistance

Antero 840CN03 was tested for resistance to chemical exposure per ASTM D543. Chemicals tested and percent change from control is listed below. For further details read the [Antero 840CN03 Chemical Resistance White Paper](#).

Table 4. Antero 840CN03 Thermoplastic Filament Chemical Resistance

Change in Mechanical Properties, Antero 840CN03 - 168 Hour Chemical Exposure (ASTM D543)			
	Reagent	XZ Orientation ⁽¹⁾	ZX Orientation ⁽¹⁾
Tensile Strength	Dichloromethane	-88%	-74.8%
	Ethyl Acetate	-2.9%	-2.3%
	Jet A	-2.1%	7.3%
	MEK	-0.7%	-2.1%
	Skydrol	-2.1%	6.3%
	Toluene	-5.0%	1.4%
	30% Nitric Acid	-5.7%	5.7%
	30% Sulfuric Acid	-9.3%	-10.1%
	60% Sodium Hydroxide	-1.4%	1.9%
	Concentrated Ammonia	-1.4%	11.0%
% Elongation @ break	Dichloromethane	714.8%	1,598.4%
	Ethyl Acetate	4.2%	16.2%
	Jet A	-0.4%	7.0%
	MEK	-4.4%	11.9%
	Skydrol	32.3%	9.7%
	Toluene	17.2%	32.4%
	30% Nitric Acid	61.4%	52.4%
	30% Sulfuric Acid	47.2%	-5.4%
	60% Sodium Hydroxide	5.2%	-1.6%
	Concentrated Ammonia	11.1%	10.8%
Tensile Modulus	Dichloromethane	-90.7%	-85.3%
	Ethyl Acetate	1.8%	6.4%
	Jet A	1.4%	5.3%
	MEK	3.1%	4.3%
	Skydrol	0.6%	6.7%
	Toluene	-0.4%	6.2%
	30% Nitric Acid	-0.8%	-6.2%
	30% Sulfuric Acid	-7.6%	-5.0%
	60% Sodium Hydroxide	0.2%	3.3%
	Concentrated Ammonia	-0.4%	5.0%

Flame, Smoke, and Toxicity

Antero 840CN03 was printed with a T20D tip on the Stratasys F900 and tested per 14 CFR 25.853, BSS 7238 and 7238, and AITM 2.0007B and 3.0005. The testing done establishes that this material, samples 0.040 inches thick unless otherwise noted, **meets requirements** for:

- 60s and 12s Vertical Burn
- 15s Horizontal Burn
- Toxic Gas Emission
- Smoke Density
- Heat Release Rate of Cabin Materials

Table 5. Antero 840CN03 Flame, Smoke, and Toxicity Test Results

	Avg Time to Extinguish (seconds)	Avg Burned Length (inches)	Drip Time to Extinguish (seconds)
12 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(ii)			
Antero 840CN03, Vertical - ZX	3.2	0.3	0 (no drips)
Antero 840CN03, Horizontal - XZ	4.7	0.2	0 (no drips)
60 Second Vertical Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(i)			
Antero 840CN03, Vertical - ZX	<1	0.5	0 (no drips)
Antero 840CN03, Horizontal - XZ	<1	0.5	0 (no drips)
Avg Burn Rate (in/min)			
15 Second Horizontal Ignition per 14 CFR 25.853(a), Appendix F, Part I, Paragraph (a)(1)(iv)(v)			
Antero 840CN03, Vertical - ZX	0		
Antero 840CN03, Horizontal - XZ	0		
	Test Mode	Average D_s (maximum) within 4 minutes, (D_{max})	
Smoke Density per BSS 7238, Rev. C			
Antero 840CN03, Vertical - ZX	Flaming	0	
Antero 840CN03, Horizontal - XZ	Flaming	0	
Smoke Density per AITM 2.0007B, Issue 3			
Antero 840CN03, Vertical - ZX	Flaming	0	
Antero 840CN03, Horizontal - XZ	Flaming	0	
Antero 840CN03, Vertical - ZX	Non-Flaming	0	
Antero 840CN03, Horizontal - XZ	Non-Flaming	0	

Table 5. Antero 840CN03 Flame, Smoke, and Toxicity Test Results

	Test Mode	CO ppm	SO ₂ ppm	NO _x ppm	HCN ppm	HCl ppm	HF ppm
Toxic Gas Emission per BSS 7239, Rev. A							
Antero 840CN03, Vertical - ZX	Flaming	5	0 (NI)	0 (NI)	0 (NI)	0 (NI)	0 (NI)
Antero 840CN03, Horizontal - XZ	Flaming	<5	0 (NI)	0 (NI)	0 (NI)	0 (NI)	0 (NI)
Toxic Gas Emission per AITM 3.0005, Issue 2							
Antero 840CN03, Vertical - ZX	Flaming	4	0	0.1	0 (NI)	0 (NI)	0 (NI)
Antero 840CN03, Horizontal - XZ	Flaming	3	0	0.3	0 (NI)	0 (NI)	0 (NI)
Antero 840CN03, Vertical - ZX	Non-Flaming	0	0	0	0 (NI)	0 (NI)	0 (NI)
Antero 840CN03, Horizontal - XZ	Non-Flaming	1	0	0	0 (NI)	0 (NI)	0 (NI)
	Peak HRR (kW/m ²)	Time to Peak Heat Release (seconds)	2 Minute Total HRR (kW-min/m ²)				
Heat Release Rate of Cabin Materials per 14 CFR 25.853(d), Appendix F, Part IV⁽¹⁾							
Antero 840CN03, Horizontal - XZ	55.9	286.7	0				
Antero 840CN03, Vertical - ZX	55.1	293	0.1				

(1) Sample thickness: 0.150 in

Outgassing

Table 6. Antero 840CN03 Outgassing Test Results

Sample	TML (%)	CVCM (%)	WVR (%)
Vertical Build - ZX	0.41	<0.01	0.17
Horizontal Build - XZ	0.45	0.01	0.15
Testing Observations⁽¹⁾			
Visible Condensate	Yes	Opaque	Yes
Percent Covered	10% (ZX), 25% (XZ)	Interference Fringes	No
Thin	Yes	Colored Fringes	No
Heavy	No	Sample Appearance After Test	No change
Transparent	No		

(1) For both orientations

Appendix

Figure 3. 2nd heating scan, DSC, for Antero 840CN03.

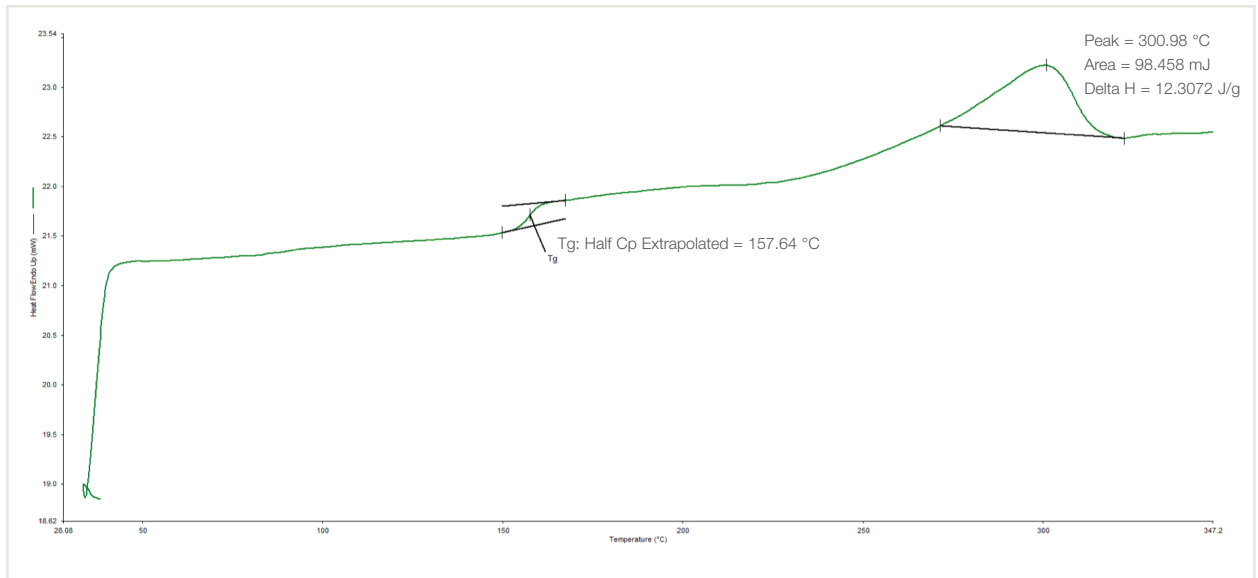


Figure 4. TMA CTE curve normal to the layers.

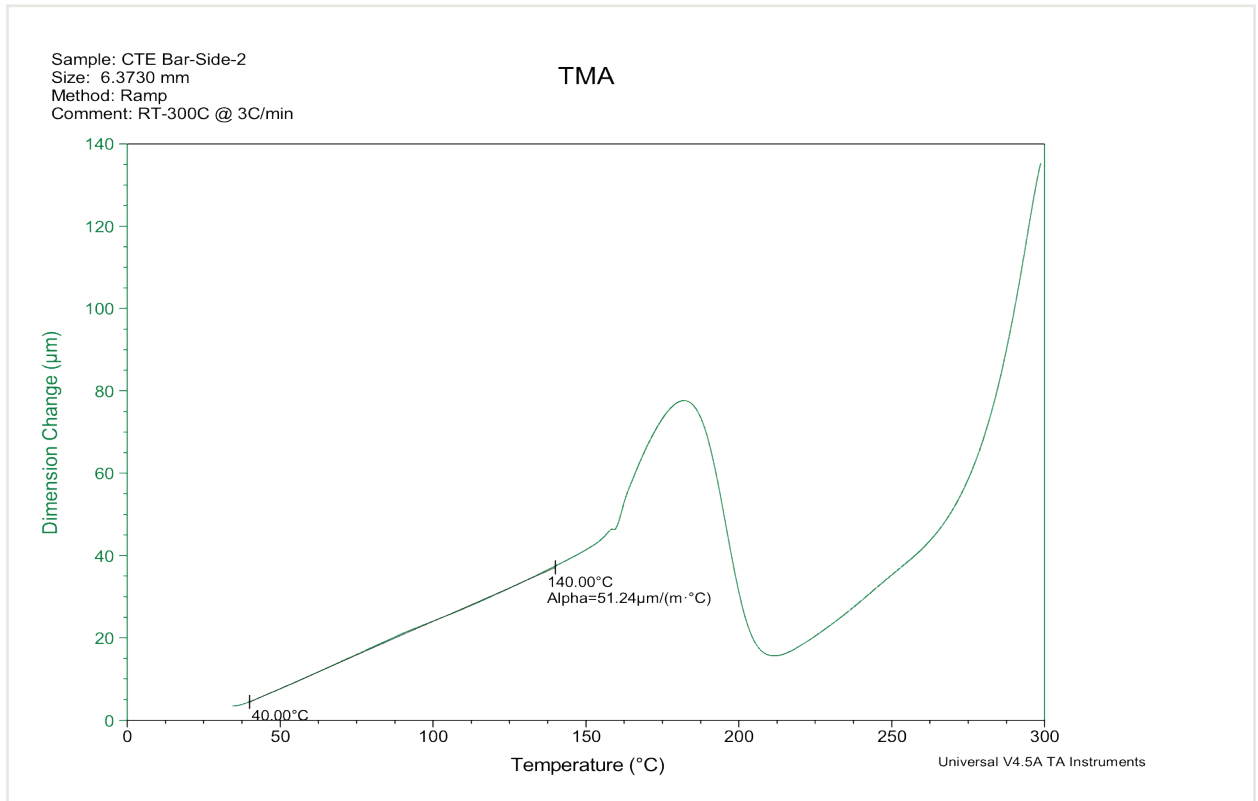
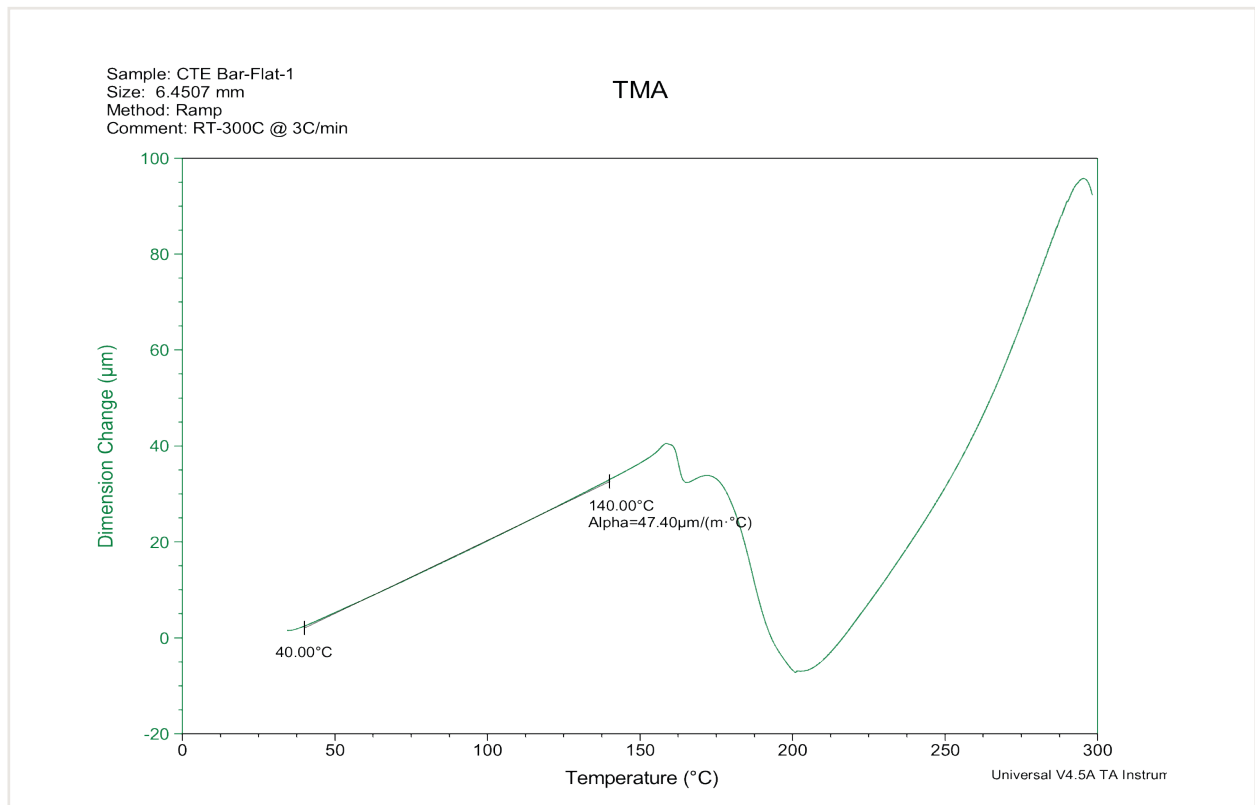


Figure 5. TMA CTE curve inplane with the layers.



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