EPU 45

EPU 45 is an energy-damping elastomer that has exceptional damping performance and printability.

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Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	17 MPa	2400 psi
Elongation at Break		290%	290%
Stress at 50% Elongation		3 MPa	430 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		9 MPa	1300 psi
Ultimate Tensile Strength		24 MPa	3500 psi

Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	28 kN/m	160 lbf/in
Compression Set	ASTM D395-B 23 °C, 72 h	31%	

Thermal Properties	Test Standard	Metric	US
T_g (DMA, tan(d))	ASTM D4065, 2 °C/min, 1Hz	30 °C	86 °F

Dielectric/Electric Properties	Test Standard	
Dielectric Constant	ASTM D150	5.51
Dissipation Factor		0.0024
Dielectric Strength	ASTM D149	19 kV/mm
Volume Resistivity	ASTM D	4.0 x 10^{14} ohm-cm

General Properties	Test Standard	
Shore A Hardness	ASTM D2240	77 (Instant), 62 (5 sec)
Bulk Density	ASTM D792	1.06 g/mL
Relative Abrasion Volume Loss	ISO-4649 A	457 mm^3

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Parts were processed using an L series printer and centrifugal spinner.

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Liquid Properties	
Liquid Density (Part A)	1.04 g/mL
Liquid Density (Part B)	0.97 g/mL
Liquid Density (Part A+B)	1.02 g/mL
Part A:B Volume Ratio (Mass Ratio)	2.665 (2.857)
25 °C Viscosity (Part A)	3800 cP
25 °C Viscosity (Part B)	150 cP
25°C Viscosity (Part A+B)	1400 cP

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Parts were processed using an L series printer and centrifugal spinner.

EPU 45

Extended TDS

EPU 45 – Properties with IPA Washing

Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	18 MPa	2500 psi
Elongation at Break		240%	240%
Stress at 50% Elongation		3 MPa	430 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		9 MPa	1300 psi
Ultimate Tensile Strength		24 MPa	3500 psi
Tear Strength	ASTM D624 Die C (die cut)	30 kN/m	171 lbf/in

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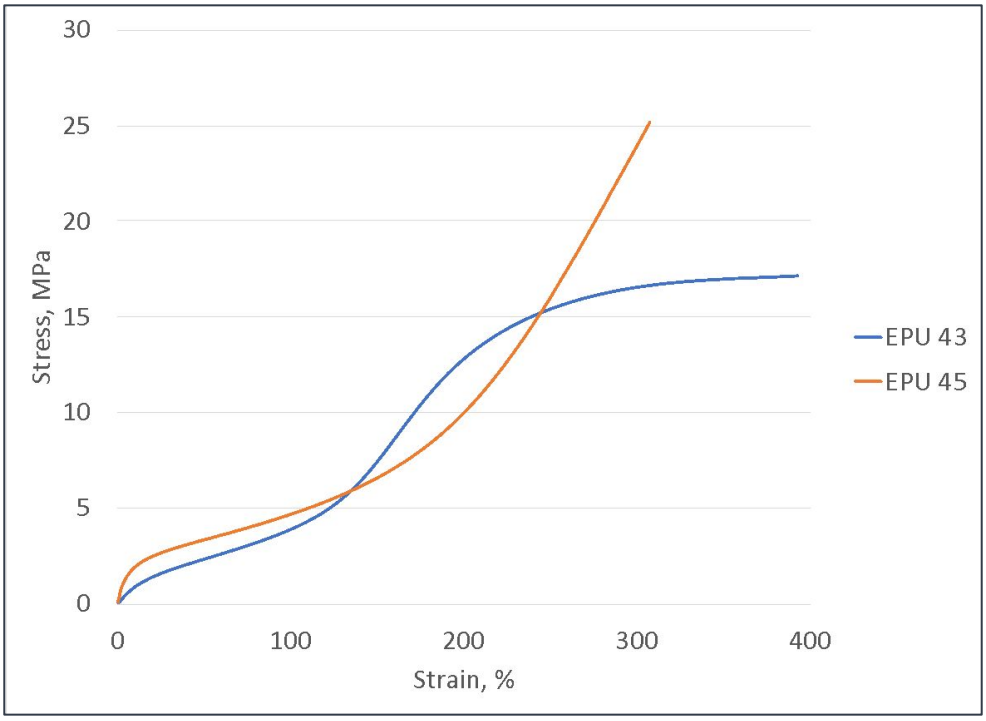
Parts were processed using an L series printer and IPA wash

EPU 45 Mechanical Properties

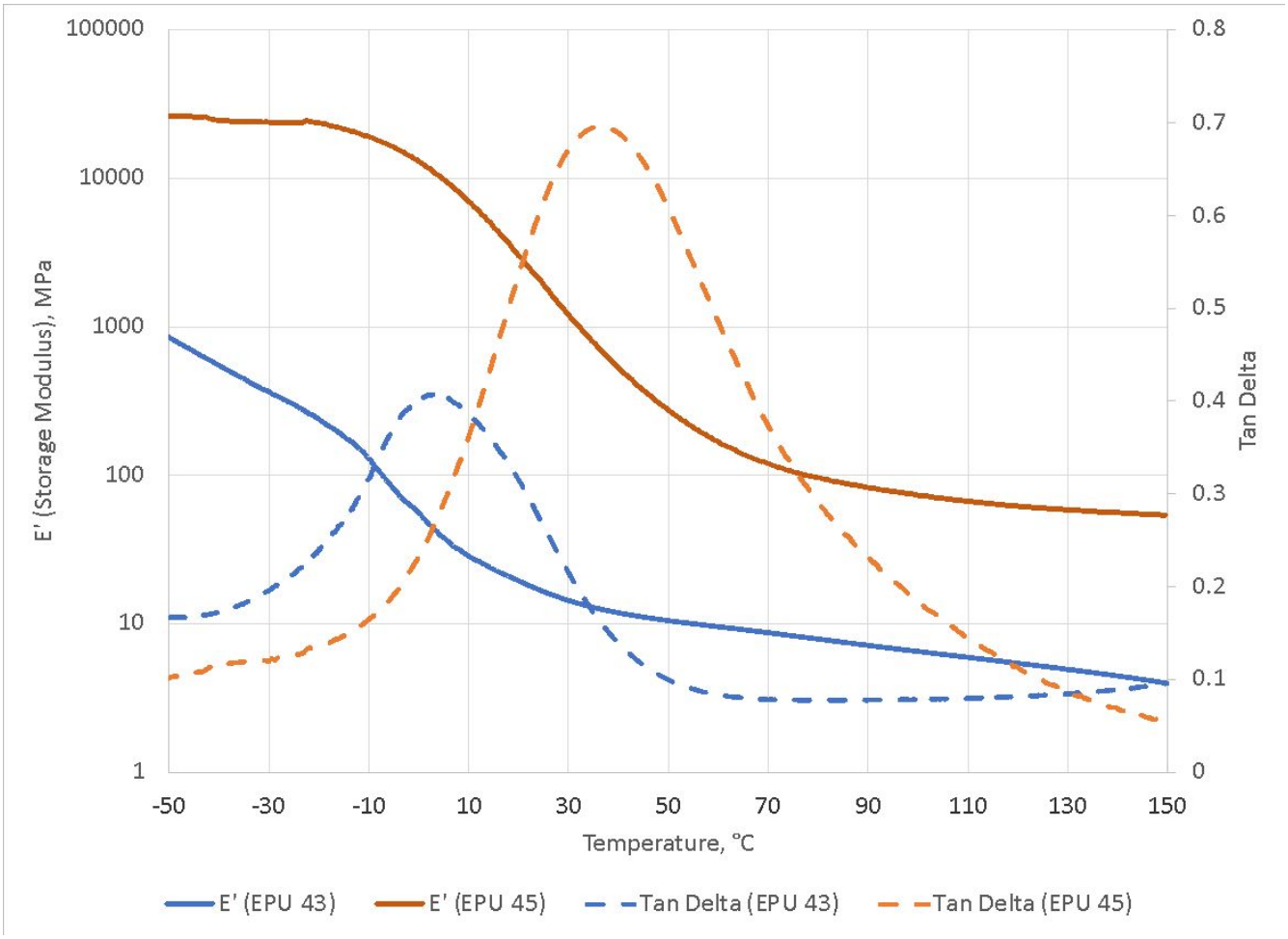
Representative Tensile Curve & comparison with EPU 43

ASTM D412, Die C, 500 mm/min



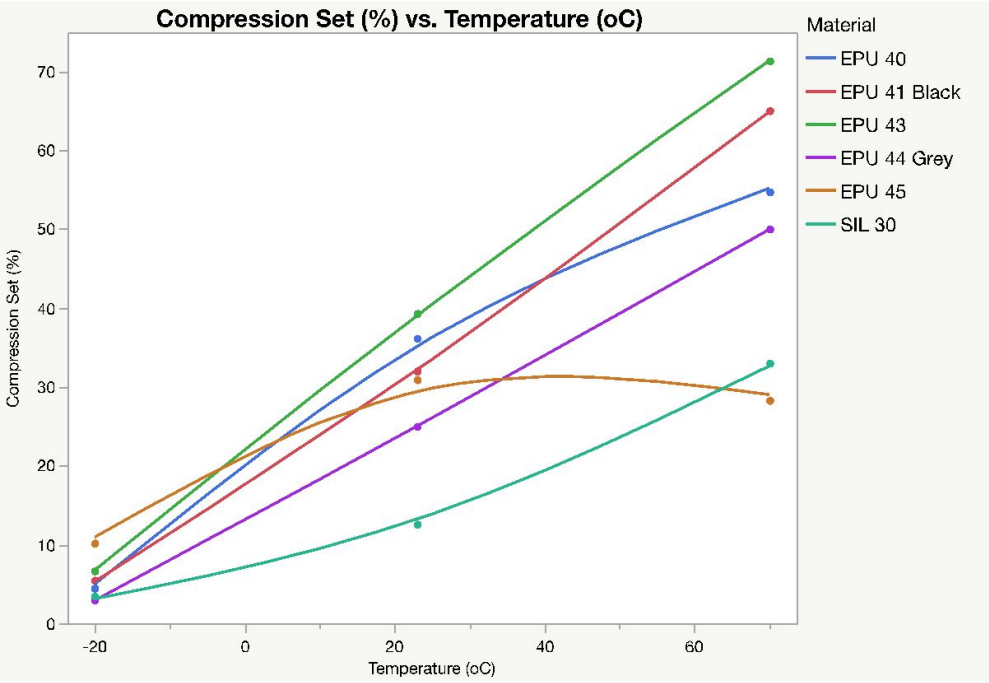
Dynamic Mechanical Analysis (DMA)
EPU 45 vs 43

The figure below shows the thermomechanical behavior of EPU 45 and its comparison to EPU 43. EPU 45 has a T_g at 30 °C and a room temperature storage modulus around 65 MPa.



EPU 45 Compression Set

In many elastomeric applications, compression set is an important property that reflects the amount of residual deformation after holding compression at a fixed time, temperature and displacement. EPU 40, EPU 41 Black, EPU 43, EPU 45, EPU 44 Gray, and SIL 30 were compressed to 25% of its original sample height and held at various temperatures (-20, 23, and 70 °C) for 72 hours. The compression set measurement is the residual deformation of a test specimen where 0% represents full recovery of the original thickness and 100% indicates no recovery. The image below summarizes the compression set results for various Carbon elastomers.



ASTM D394-14 Method B

EPU 45 Chemical Compatibility

	Mass Gain* (%)
Household Chemicals	
Bleach (NaClO, 5%)	< 5%
Sanitizer (NH_4Cl, 10%)	5 - 15%
Distilled Water	< 5%
Sunscreen (Banana Boat, SPF 50)	5 - 15%
Detergent (Tide, Original)	5 - 15%
Windex Powerized Formula	5 - 15%
Hydrogen Peroxide (30%)	> 30%
Ethanol (95%)	> 30%
Industrial Fluids	
Diesel (Chevron #2)	< 5%
Strong Acid/Base	
Sulfuric Acid (30%)	> 30%
Sodium Hydroxide (10%)	< 5%
Sebum	5 - 15%

*Percent weight gained after one week submersion following ASTM D543.
Values do not represent changes in dimension or mechanical properties.

EPU 45 Biocompatibility

Biocompatibility Testing

Printed parts were provided to NAMSA for evaluation in accordance with ISO 10993-10, Biological evaluation of medical devices - Part 10: Tests for irritation and skin sensitization (specifically the Closed Patch Sensitization Study and dermal contact irritation). Parts were processed using an L series printer and centrifugal spinner. The results for all tests indicated that EPU 45 passed the requirements for biocompatibility according to the above tests. Carbon makes no representation and is not responsible for the results of any biocompatibility tests other than those specified above.

Disclaimer

Biocompatibility results may vary based on printing and/or post-processing procedures.

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