EPU 43

EPU 43 is an energy-damping elastomer that is soft while offering good energy damping and excellent durability under high-cycle flexing.

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Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	10 MPa	1450 psi
Elongation at Break		380%	380%
Stress at 50% Elongation		2 MPa	290 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		13 MPa	1900 psi
Ultimate Tensile Strength		17 MPa	2500 psi

Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	23 kN/m	131 lbf/in
Compression Set	ASTM D395-B 23 °C, 72 h	39%	
Ross Flex, 23 °C	ASTM D1052	> 350,000 cycles (with crack growth < 500%)	

Thermal Properties	Test Standard	Metric	US
T_g (DMA, tan(d))	ASTM D4065, 2 °C/min, 1 Hz	4 °C	39 °F

Dielectric/Electric Properties	Test Standard	
Dielectric Constant	ASTM D150	6.75
Dissipation Factor		0.0015
Dielectric Strength	ASTM D149	16 kV/mm
Volume Resistivity	ASTM D257	2.7 x 10^{14} ohm-cm

General Properties	Test Standard	
Shore A Hardness	ASTM D2240	76 (Instant), 71 (5 sec)
Bulk Density	ASTM D792	1.03 g/mL
Relative Abrasion Volume Loss	ISO-4649 A	213 mm^3

Parts were processed using an L series printer and centrifugal spinner. The cleaned test articles were baked following the standard baking schedule for EPU 43.

EPU 43

Liquid Properties	
Liquid Density (Part A)	0.99 g/mL
Liquid Density (Part B)	0.94 g/mL
Liquid Density (Part A+B)	0.99 g/mL
Part A:B Volume Ratio (Mass Ratio)	11.3 (11.9)
25 °C Viscosity (Part A)	2900 cP
25 °C Viscosity (Part B)	80 cP
25 °C Viscosity (Part A+B)	2400 cP

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EPU 43

Extended TDS

EPU 43 with IPA Washing

Tensile Properties	Test Standard	Metric	US
Tensile Modulus	ASTM D412 Die C 500 mm/min	11 MPa	1600 psi
Elongation at Break		420%	420%
Stress at 50% Elongation		2 MPa	290 psi
Stress at 100% Elongation		4 MPa	580 psi
Stress at 200% Elongation		13 MPa	1900 psi
Ultimate Tensile Strength		19 MPa	2750 psi
Tear Strength	ASTM D624 Die C (die cut)	26 kN/m	148 lbf/in

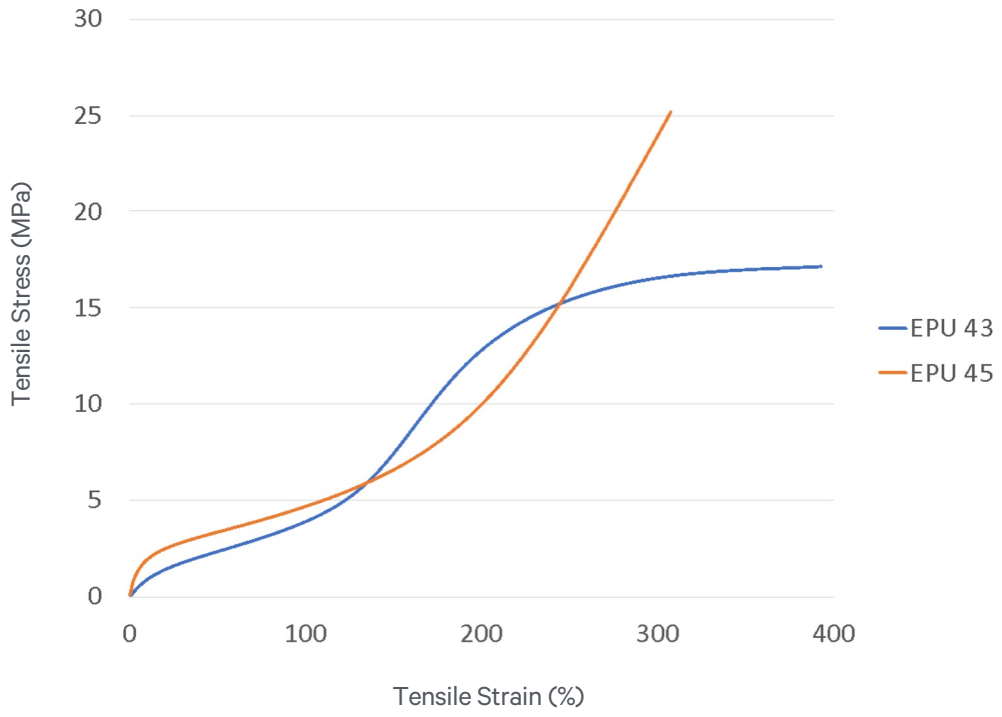
Other Mechanical Properties	Test Standard	Metric	US
Tear Strength	ASTM D624 Die C (die cut)	26 kN/m	148 lbf/in

Parts were processed using an L series printer and washed by isopropanol for 1 min. The cleaned test articles were baked following the standard baking schedule for EPU 43.

EPU 43 Mechanical Properties

Representative Tensile Curve & Comparison with EPU 45

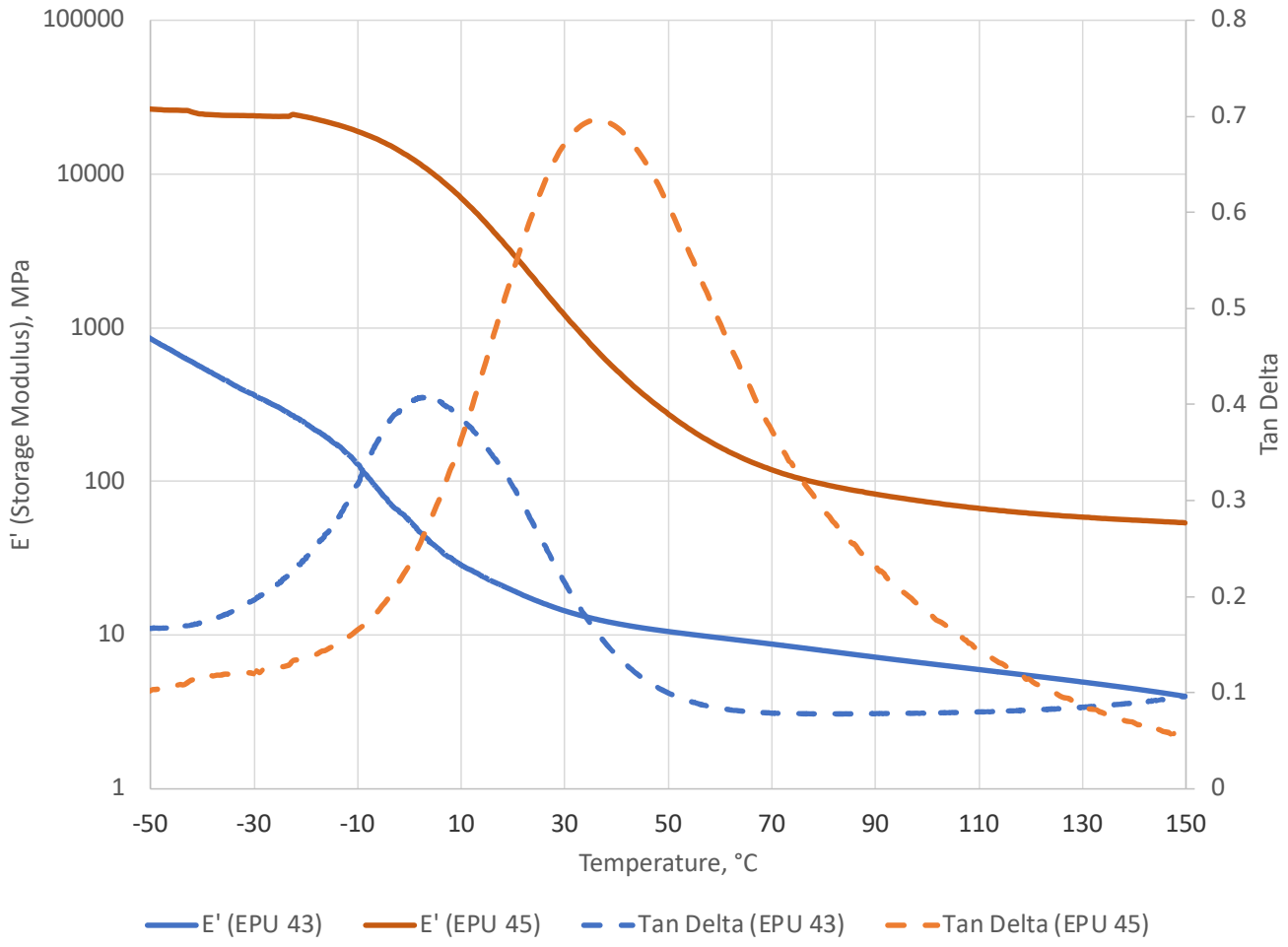
ASTM D412, Die C, 500 mm/min



EPU 43 Dynamic Mechanical Analysis (DMA)

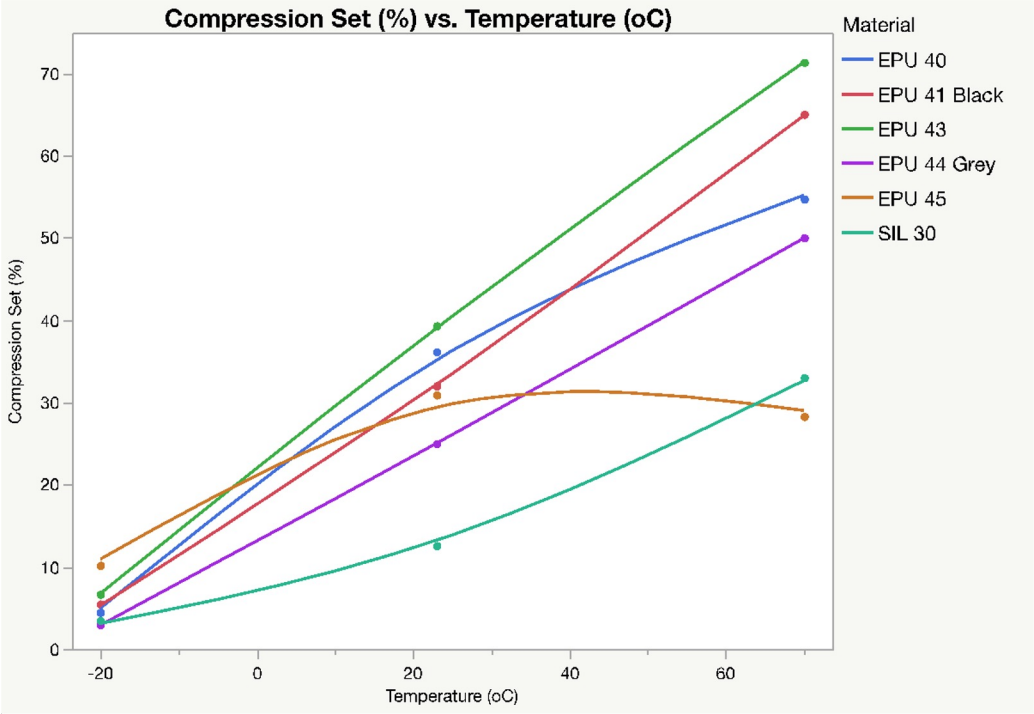
EPU 43 vs. EPU 45

The figure below shows the thermomechanical behavior of EPU 43 compared to EPU 45. EPU 43 has a T_g at 4 °C and a room temperature storage modulus around 18 MPa.



EPU 43 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 44 Gray, EPU 45, 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 D395-B

EPU 43 Chemical Compatibility

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

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

EPU 43 Biocompatibility

Biocompatibility Testing

Test articles in the form of printed parts were provided to NAMSA for evaluation and met the requirements of the following test:

Biocompatibility Testing	Test Standard
Sensitization	ISO 10993-10: Biological evaluation of medical devices – Part 10: Tests for skin sensitization (Closed patch sensitization study in guinea pigs)

Test articles were processed using an L series printer and centrifugal spinner. The cleaned test articles were baked following the standard baking schedule for EPU 43 (see below). Additional details about the test are available upon request.

Baking schedule: Ramp from room temperature to 140 °C over 90 minutes; Hold at 140°C for 90 minutes.

Disclaimer

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