EPX 82

EPX 82 combines functional toughness, stiffness, and temperature resistance making it useful in a variety of automotive, industrial, and consumer applications.

Tensile Properties ISO 572-2, 1A, 5mm/min	**DRY**		**CONDITIONED**	
	Metric	U.S.	Metric	U.S.
Tensile Modulus	2800 MPa	410 ksi	2800 MPa	410 ksi
Strength at Yielding / Ultimate Tensile Strength	82 MPa	12 ksi	72 MPa	10 ksi
Strain at Yielding	5.5 %		5.6 %	
Strength at Break	78 MPa	11 ksi	67 MPa	9.7 ksi
Elongation at Break	5.9 %		11 %	

Flexural Properties ASTM D790-B	**DRY**		**CONDITIONED**	
	Metric	U.S.	Metric	U.S.
Flexural Stress at 5 % strain	130 MPa	19 ksi	110 MPa	16 ksi
Flexural Modulus	3000 MPa	440 ksi	2900 MPa	420 ksi

Impact Properties	**DRY**		**CONDITIONED**	
	Metric	U.S.	Metric	U.S.
Notched Izod (Machined), ASTM D256	44 J/m	0.82 ft-lb/in	42 J/m	0.79 ft-lb/in
Unnotched Izod, ASTM D4812	370 J/m	6.9 ft-lb/in	350 J/m	6.6 ft-lb/in
Notched Charpy (Machined), ISO 179-1/1eA	4.4 kJ/m^2	2.1 $ft\text{-}lb/in^2$	4.2 kJ/m^2	2.0 $ft\text{-}lb/in^2$
Unnotched Charpy, ISO 179-1/1eU	26 kJ/m^2	12 $ft\text{-}lb/in^2$	26 kJ/m^2	12 $ft\text{-}lb/in^2$
Gardner, ASTM D5420 GC, 3.2mm	0.55 J	0.41 ft-lb	0.56 J	0.41 ft-lb

Thermal Properties	Metric	U.S.
Heat Deflection Temperature @ 0.455 MPa/66 psi, ASTM D648 Measured after 3 weeks in ambient conditions	115 °C	240 °F
Heat Deflection Temperature @ 1.82 MPa/264 psi, ASTM D648 Measured after 3 weeks in ambient conditions	99 °C	210 °F
Coefficient of Thermal Expansion (-60, 100 °C), ASTM E831	88 ppm/°C	49 ppm/°F
Flammability, UL 94 (1.5 mm, 3.0mm)	HB	

General Properties	Metric
Hardness, Shore D, ASTM D2240	89 (instant), 88 (5 sec)
Density, ASTM D792	1.155 g/cm^3
Density (liquid resin)	1.12 g/cm^3
Water Absorption, 23 °C, 24 hours, ASTM D570	0.74 %
Taber Abrasion, ASTM D4060, CS-17, 1 kg, 100 % vacuum	42 mg / 1000 cycles

NOTES—Results in this data sheet represent typical values from specific sample generation and testing processes and may vary if the established protocols are not followed. Dry values were measured within 6 hours of completion of thermal cure. Conditioned values were measured after 1 week at 23°C and 50% RH unless stated otherwise. Contact Carbon for the specific process used to generate the test samples to determine each of these values. The U.S. values are converted from Metric measurements and are for reference only.

The information in this document includes typical values from printing various parts and is intended for reference and comparison purposes only. This information should not be used for testing, design specification or quality control purposes. End-use material performance can be impacted by, but not limited to, design, processing, operating and end-use conditions, test conditions, color, etc. Actual values will vary with build conditions. In addition, product specifications are subject to change without notice.

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EPX 82 Expanded TDS

EPX 82 Expanded TDS Table of Contents

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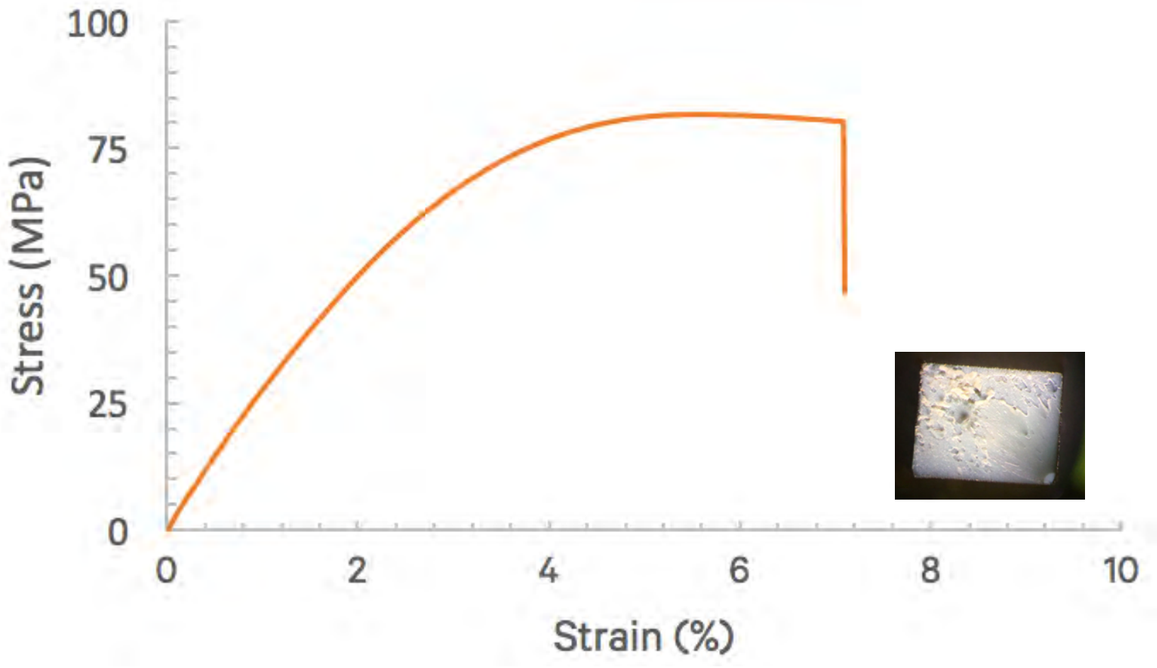
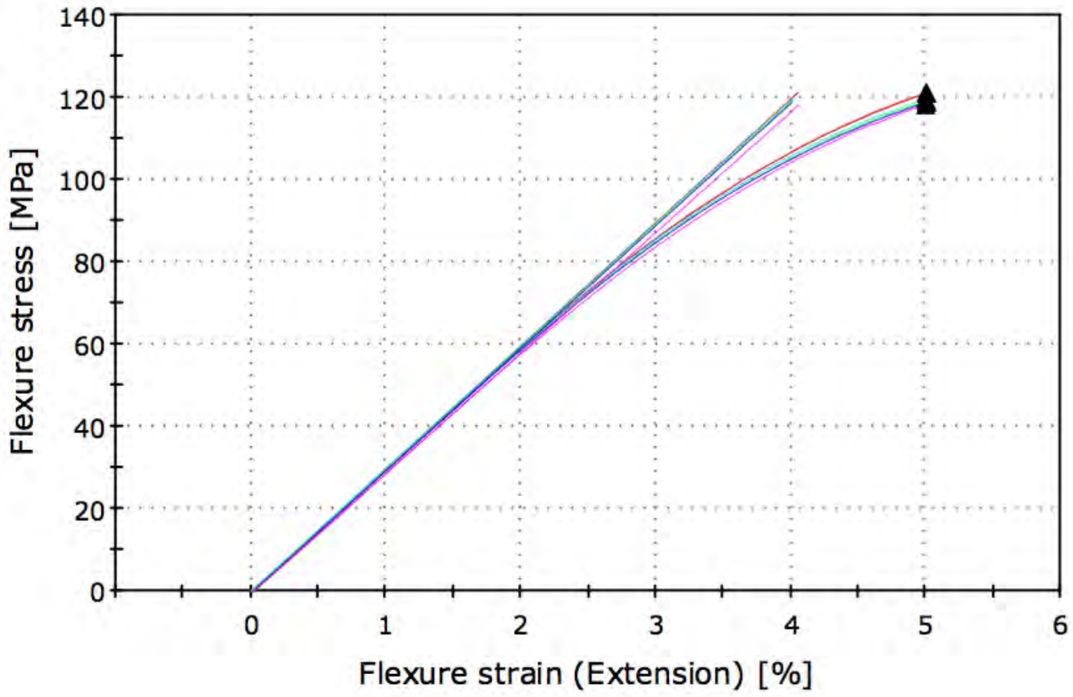
Base Mechanical Properties

EPX 82 is a rigid material which shows a defined yield point and high ultimate stress in tension and flexural testing. This toughness is evident in the inset photograph, showing characteristic ductile modes along the fracture plane.



Tensile test method: ASTM D638 Type 1 dogbone, 5 mm/min strain rate, dry

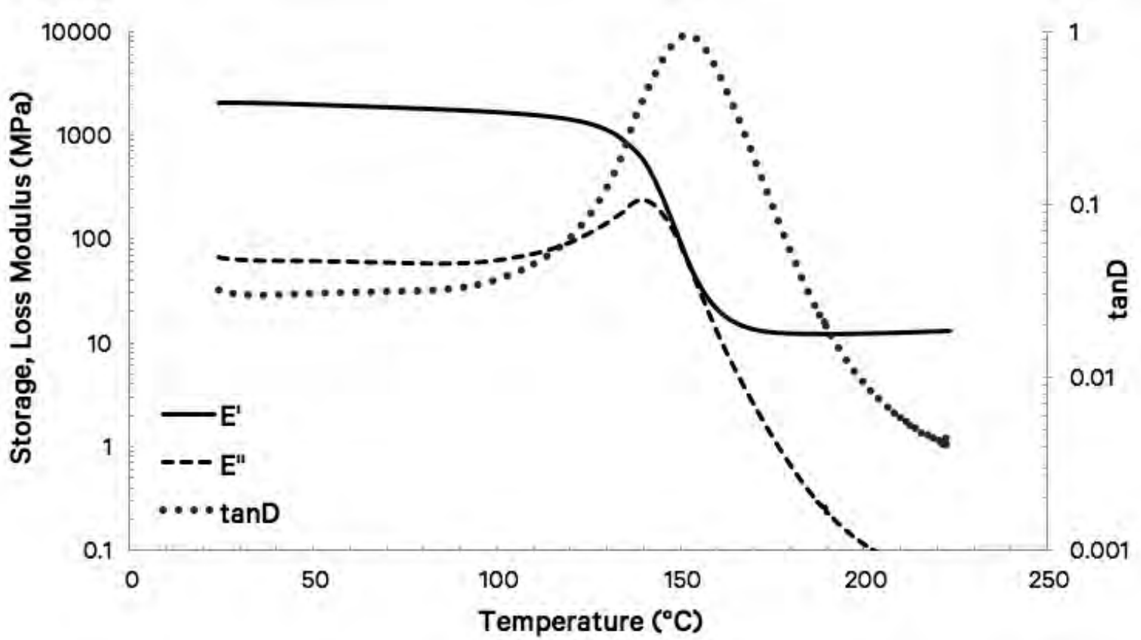


Flexural test method: ASTM D790-B, 40mm span, sample thickness: 3.18mm, dry

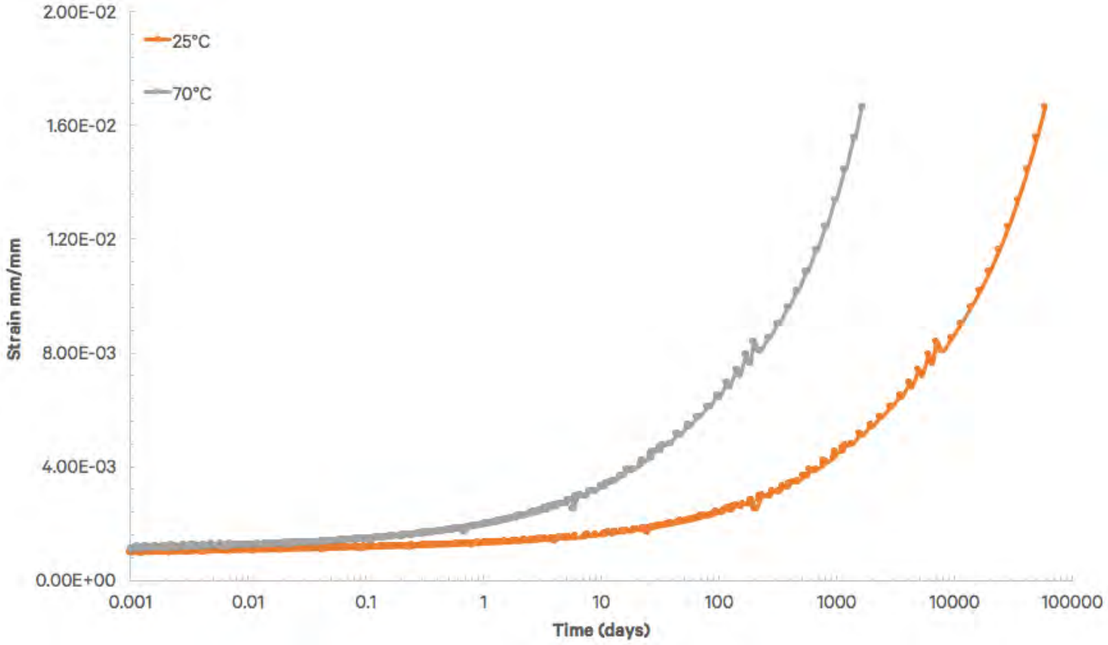
Base Thermal Properties

EPX 82 has excellent heat resistance, with a heat deflection temperature (0.455 MPa) greater than 100°C (exact value depends on sample conditioning - see Water Uptake section). EPX82 exhibits a sharp transition in dynamic mechanical analysis. The low loss modulus and damping coefficient (tanD) correlate to excellent dimensional stability at elevated temperature.

This is further reflected in tests of EPX 82's creep resistance. Creep time-temperature superposition is used to simulate longterm creep behavior.



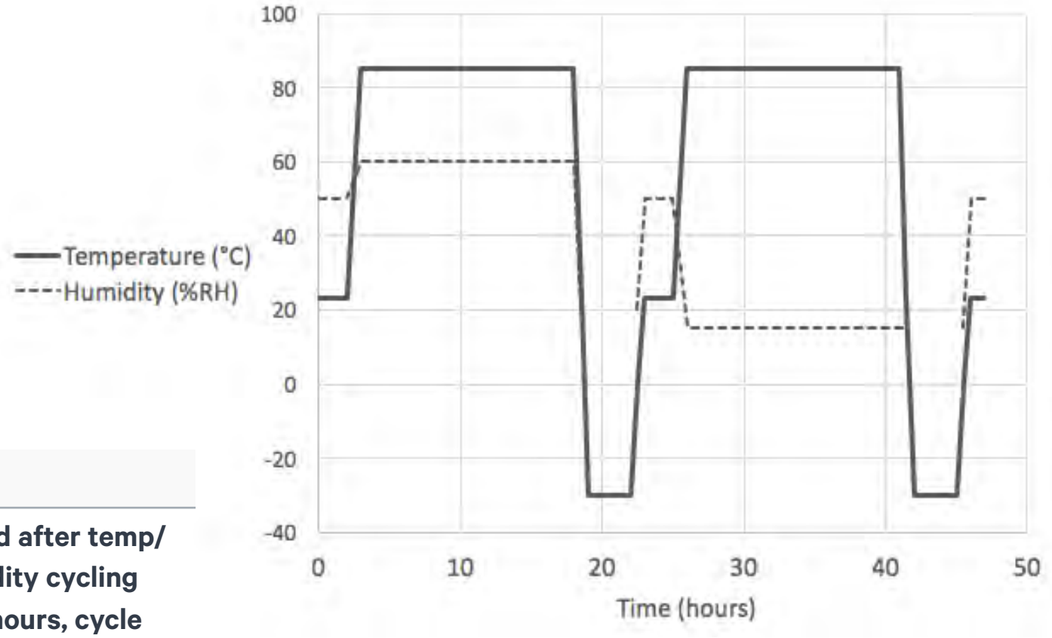
Test method: TA Q800 DMA, single cantilever mode, 25-225°C sweep, 1°C/min, 1 Hz, 1mm sample, dry-as-printed



Creep TTS test method: TA Q800 DMA, single cantilever mode, 30x15x3.2 mm sample, 0-125°C sweep at 5°C increments with 5 minute isothermal and 10 minute deformation, 2 MPa applied load, dry

Material Endurance — Automotive

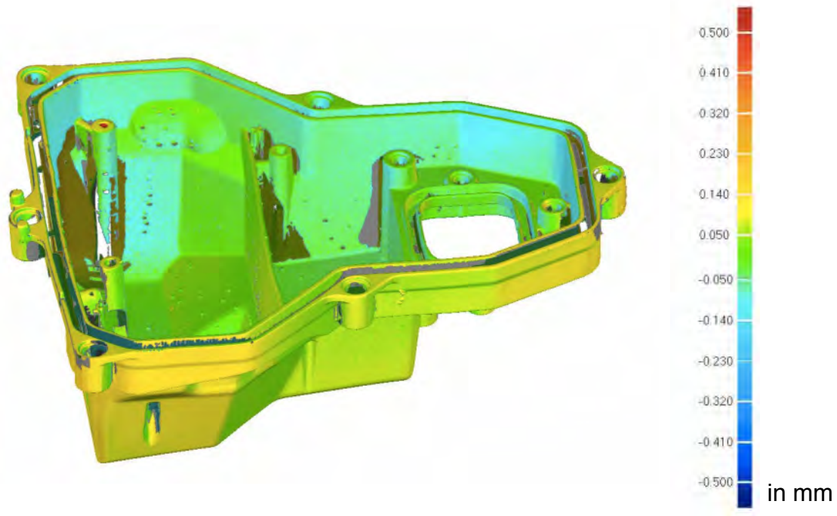
EPX 82 is a cross-linked aromatic epoxy/amine, which leads to excellent retention of material properties during high temperature aging, temperature/humidity cycling, and thermal shock. EPX 82 is able to retain function with minimal property degradation after aging tests required for automotive and industrial brackets/mounts/housings.



Temp/humidity cycling schedule: cycle repeated 4x, 240 hours total

Material Endurance — Automotive			
	Initial*	**Retained after heat aging (168 hours at 100°C)**	**Retained after temp/ humidity cycling (240 hours, cycle shown to right)**
Tensile Modulus	3000 MPa	101%	95%
Yield Strength	74 MPa	104%	101%
Elongation at Yield	5.5%	104%	96%
Elongation at Break	11%	100%	92%
Notched Izod Impact (23°C)	50 J/m	100%	96%

*Conditioned ASTM D638 Type V dogbones and Izod bars



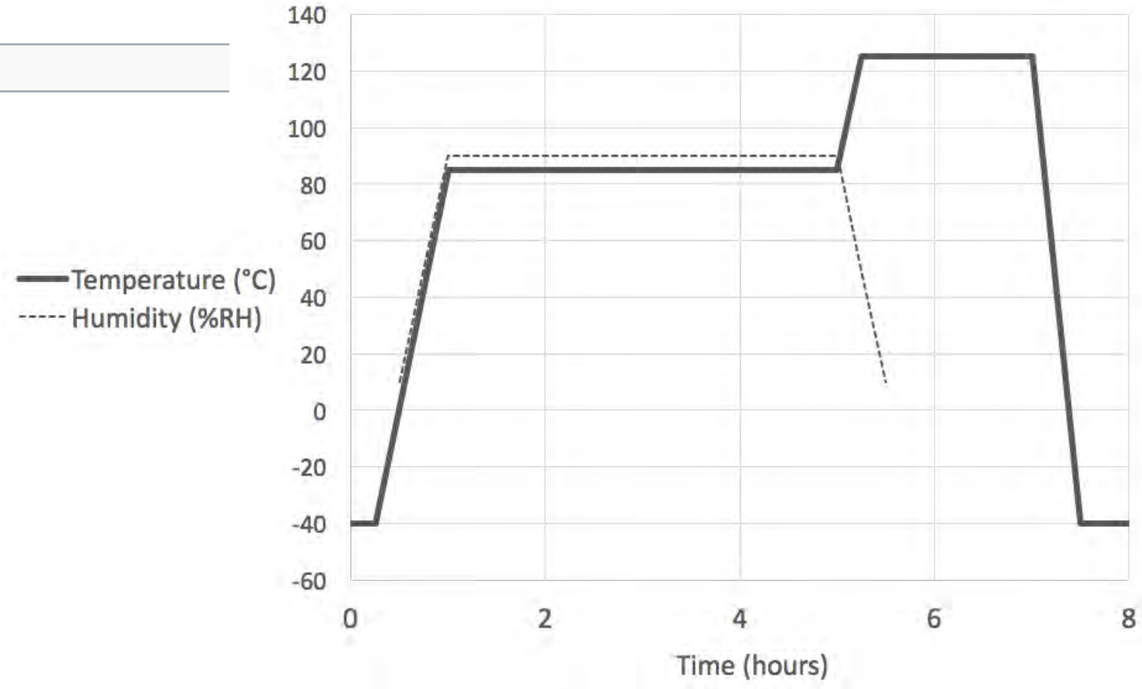
DC charger housing shows minimal dimensional change after automotive thermal/humidity cycling, with 95% of points within ±150um of initial

Material Endurance — Connectors

Material Endurance — Electrical connector testing

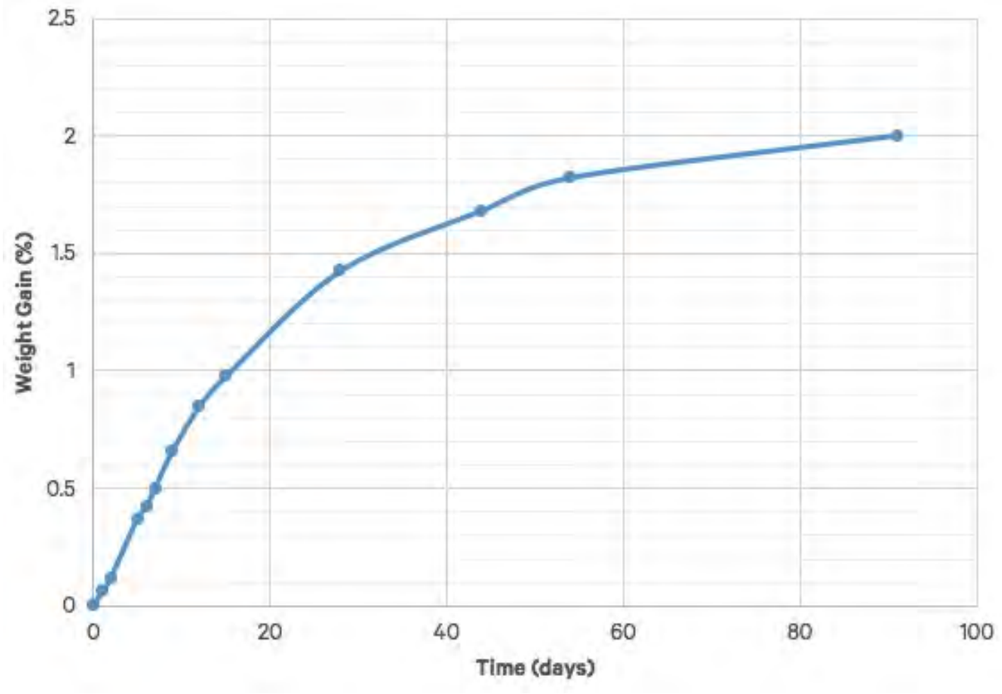
	Initial*	Heat aging: 1008 hours, 125°C	Temp/humidity cycling: 40 cycles, shown to right	Thermal shock: 100 cycles, -40-125°C
		Percent Retained		
Tensile Modulus (MPa)	3000 MPa	104%	95%	100%
Yield Strength	74 MPa	111%	101%	104%
Elongation at Yield	5.5%	105%	96%	96%
Elongation at Break	11%	75%	92%	80%
Notched Izod Impact (23°C)	50 J/m	102%	96%	96%

*Conditioned ASTM D638 Type V dogbones and Izod bars

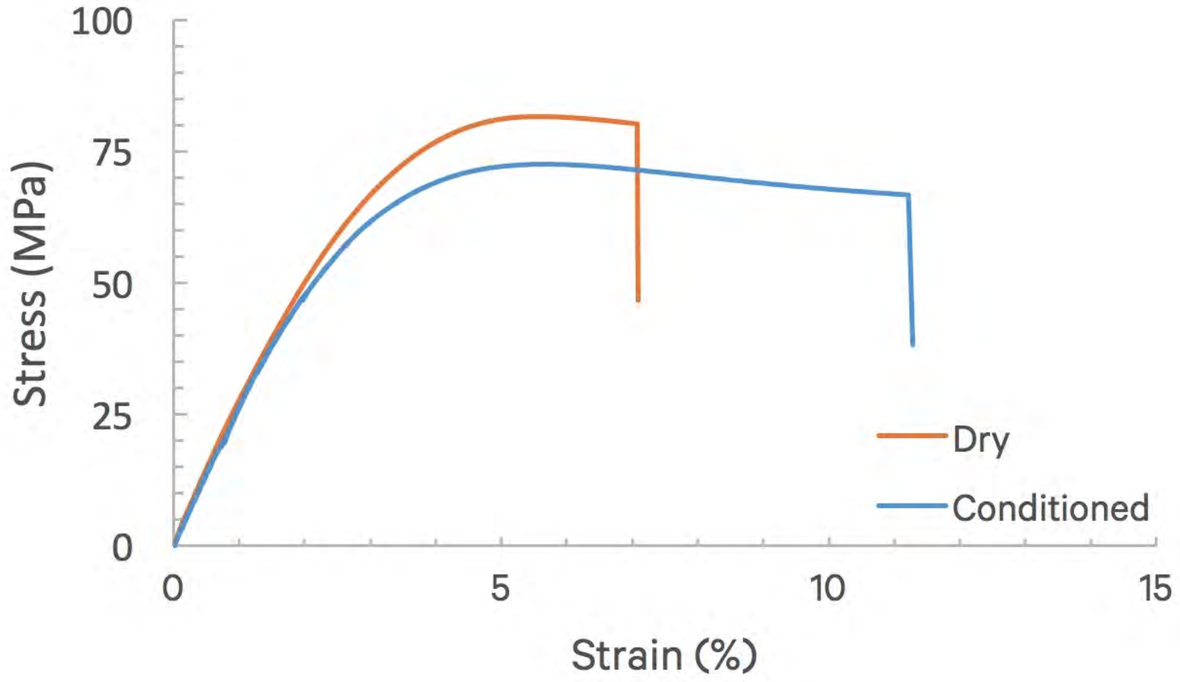


Water Uptake

Like the polyamide family of polymers (Nylons), EPX 82 absorbs and releases water from the atmosphere based on ambient humidity. This process is reversible and the impact of this moisture uptake on mechanical properties is relatively low due to the highly crosslinked nature of EPX 82. EPX 82 takes up approximately 2% by weight of water at 23°C/50%RH in equilibrium conditions. This water leads to small decreases in modulus and yield strength, with accompanying increases in elongation and a decrease in heat deflection temperature (0.455 MPa) to approximately 105°C at equilibrium conditions.



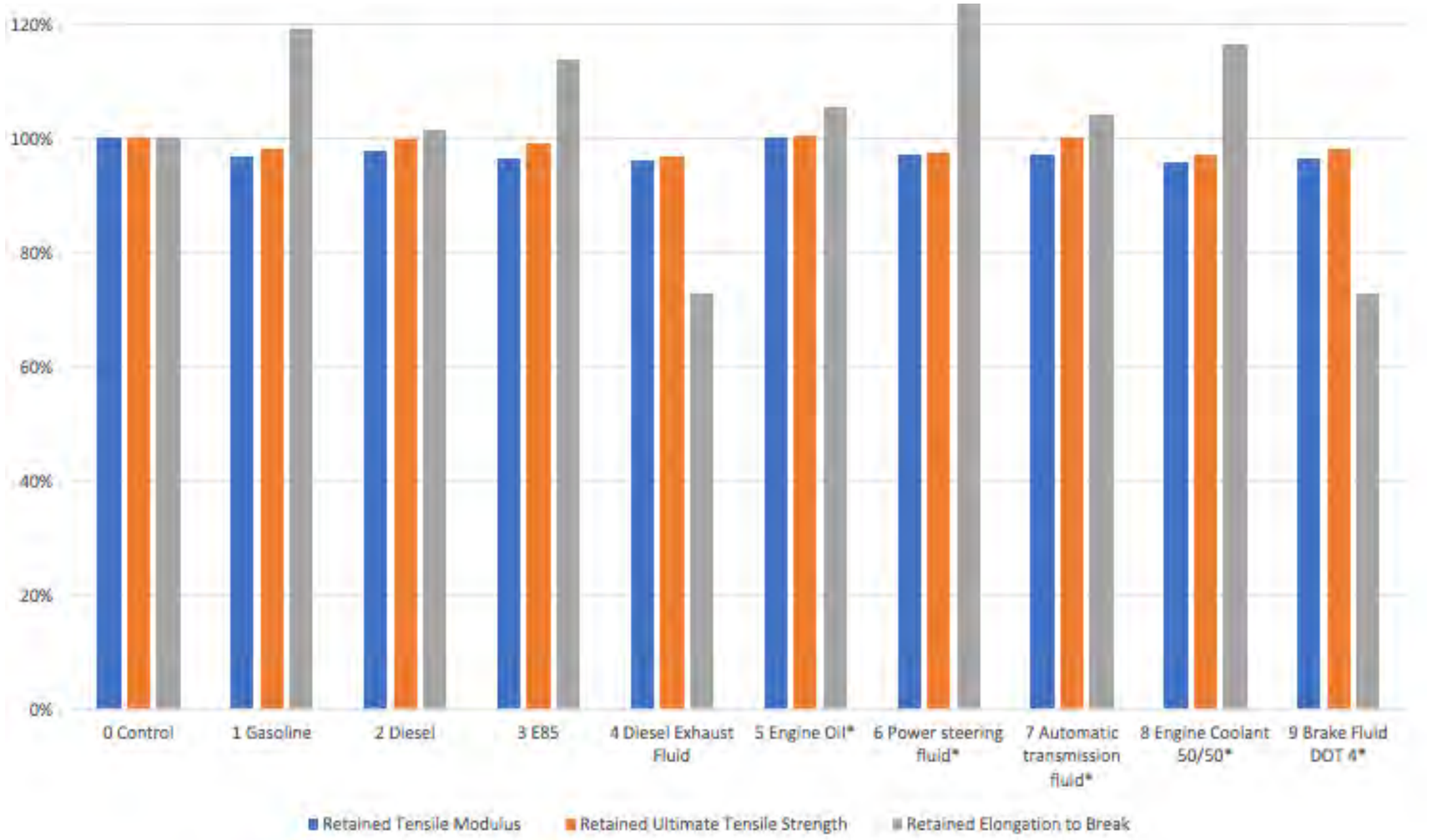
Test method: ASTM D570 coupons (3” x 1” x 1/8”), conditioned at 23°C/50%RH



Conditioning method: Conditioned 2 weeks, 23°C/50%RH. ASTM D638 Type V dogbones

Chemical Resistance — USCAR2

Epoxies as a chemical family exhibit excellent chemical resistance. EPX 82 shows similar performance, showing no surface blemishes and minimal change in tensile properties after chemical exposure simulating splash contact per USCAR2 conditions.



Test method: samples submerged in test liquid for 30 minutes at 23°C or 50°C (starred) and left 1 week with liquid on surface