Electronic Supplementary Material (ESI) for Soft Matter.
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Supporting Information

Localizing Genesis in Polydomain Liquid Crystal Elastomers

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Gel fraction determination

Gel fractions were averaged over three samples for each formulation and genesis. Each sample was weighed prior to soaking in DCM for 72 hours. Samples were then dried for 24 hours before weighing again. Gel fractions were calculated by the following equation:

$$Gel\ Fraction\ (\%) = \frac{Final\ weight}{Initial\ weight} \times 100$$

Differential scanning calorimetry

Thermal analysis was done for each formulation and genesis using TA Instruments' DSC 2500 differential scanning calorimeter (DSC). A heat-cool-heat cycle was applied to the samples with a heating rate of 10°C/min and a cooling rate of 5°C/min. Glass transition temperatures were calculated using the second heating curve of each sample.

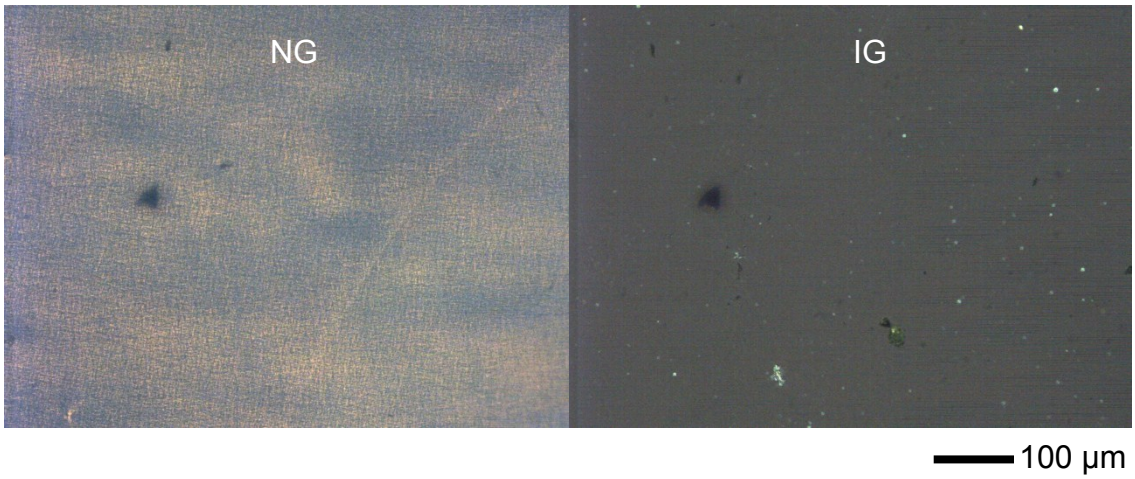

Figure S1: Polarized optical micrographs of nematic genesis (NG, left) and isotropic genesis (IG, right) C11M/TMPTMP polydomain LCEs. Other formulations look identical.

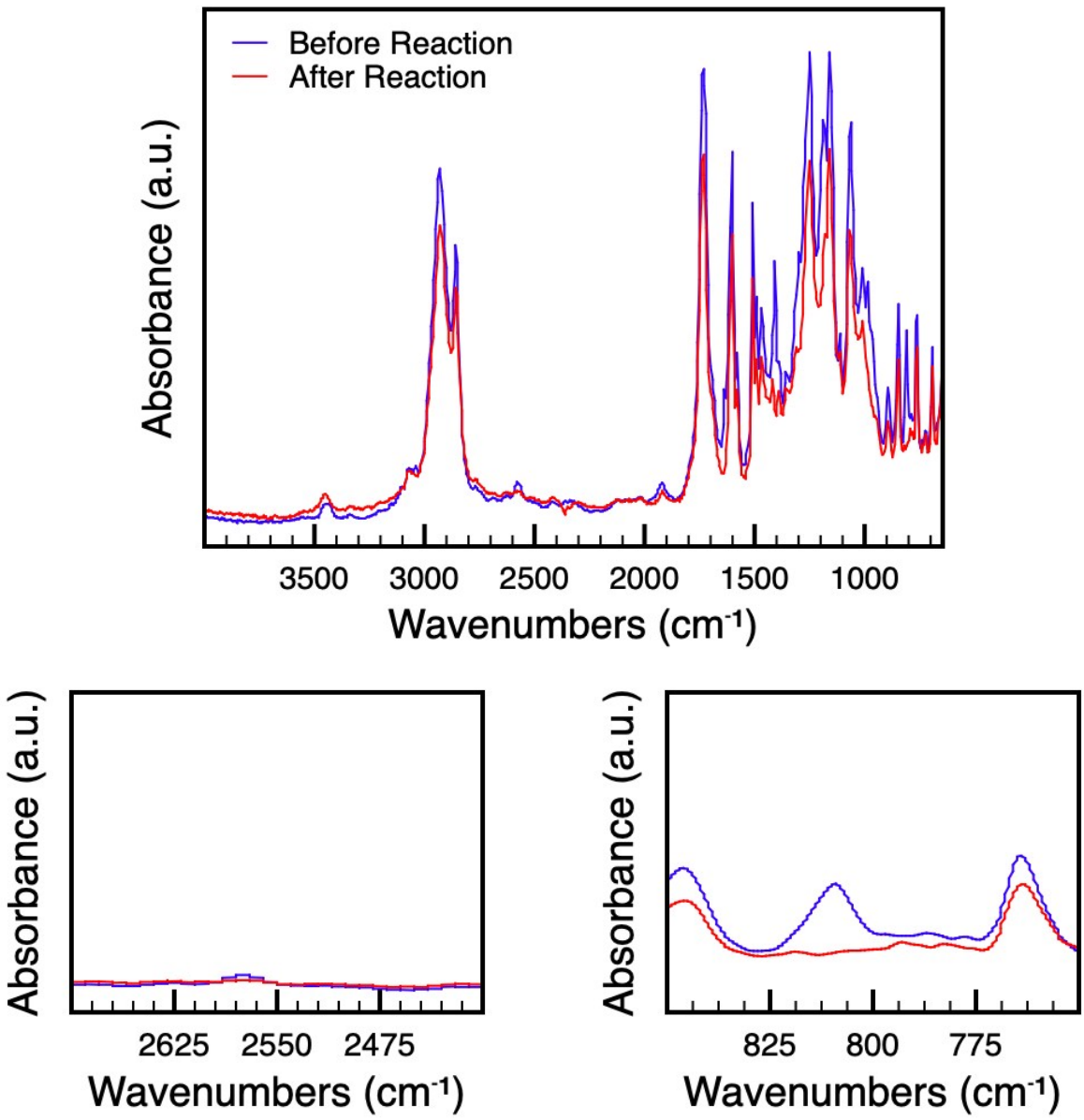

Figure S2: Representative spectra from the IG C11M/TMPTMP formulation. Sepctra are given before reaction and 5 minutes after reaction. The thiol peak (bottom left, 2550-2600 cm^{-1}) and acrylate peak (bottom right, 810 cm^{-1}) are shown before and after reaction.

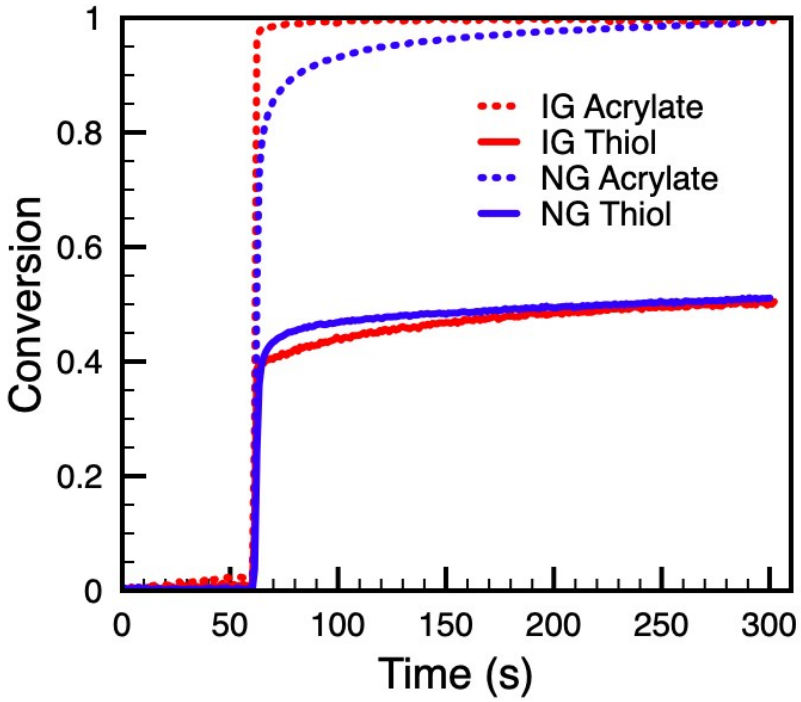

Figure S3: Real-time infrared spectroscopy determination of conversion data during the photopolymerization of C11M/GDMP to form IG and NG polydomain LCE. Reaction was carried out after 60 seconds using 365 nm light at 8 mW/cm^2.

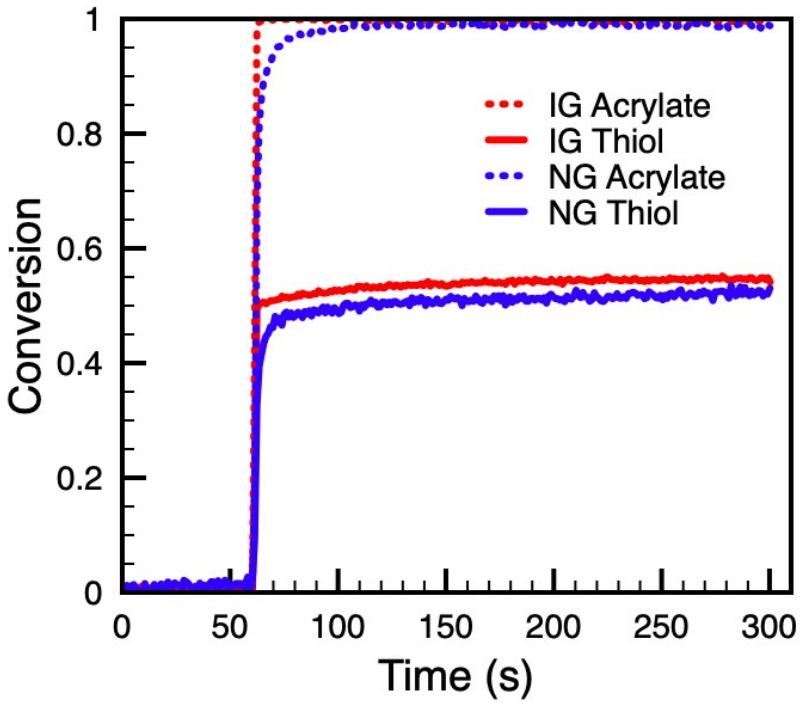

Figure S4: Real-time infrared spectroscopy determination of conversion data during the photopolymerization of C11M/TMPTMP to form IG and NG polydomain LCE. Reaction was carried out after 60 seconds using 365 nm light at 8 mW/cm^2.

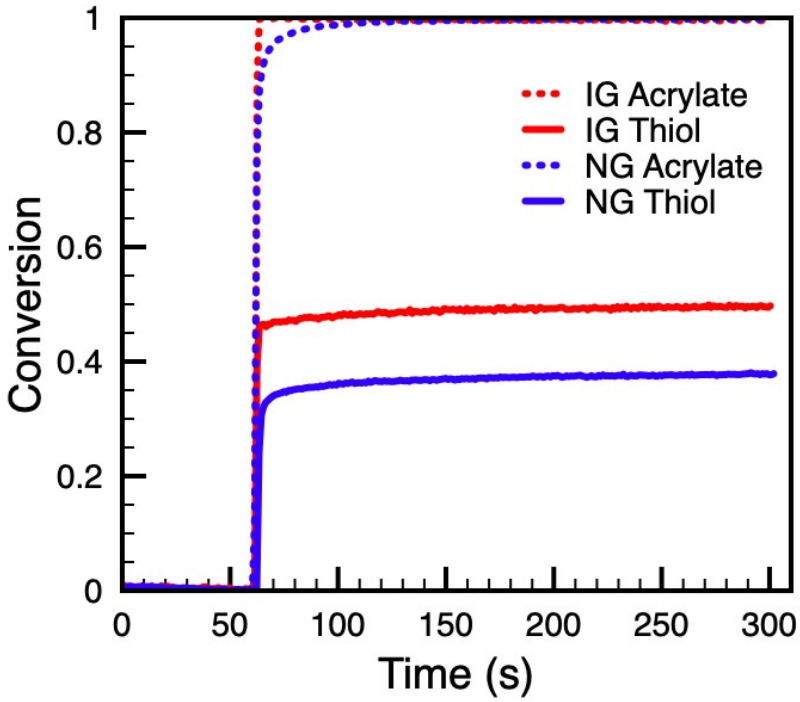

Figure S5: Real-time infrared spectroscopy determination of conversion data during the photopolymerization of C11M/PETMP to form IG and NG polydomain LCE. Reaction was carried out after 60 seconds using 365 nm light at 8 mW/cm^2.

Table S1: Gel fractions of IG and NG polydomain LCE examined here.

	Gel Fraction (%)	
Formulation	IG	NG
C11M/GDMP	96.8 ± 0.9	98.4 ± 1.6
C11M/TMPTMP	98.7 ± 1.0	96.4 ± 2.9
C11M/PETMP	97.5 ± 1.3	94.4 ± 3.2

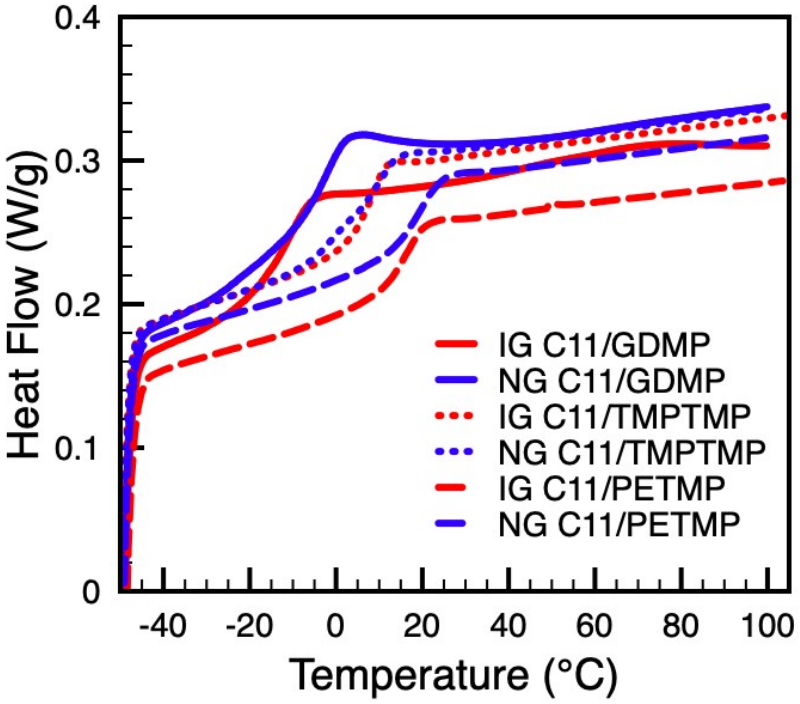

Figure S6: DSC curves (second heating) for each formulation and genesis.

Table S2: Glass transition temperatures for each formulation and genesis (from DSC, midpoint of transition).

	Glass Transition Temp. (°C)	
Formulation	IG	NG
C11M/GDMP	-16	-12
C11M/TMPTMP	3	1
C11M/PETMP	12	11

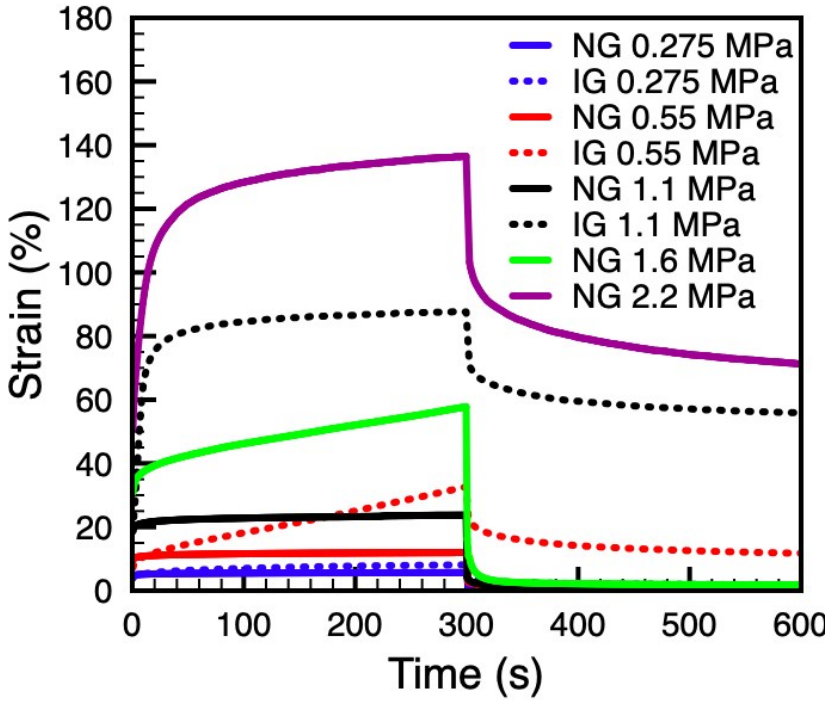

Figure S7: Creep recovery tests for C11M/GDMP at stress values (inset) to deform material beneath, just above, and above the stress needed to induce soft elasticity. Stresses were applied for 5 minutes, and the material was allowed to relax for 5 more minutes.

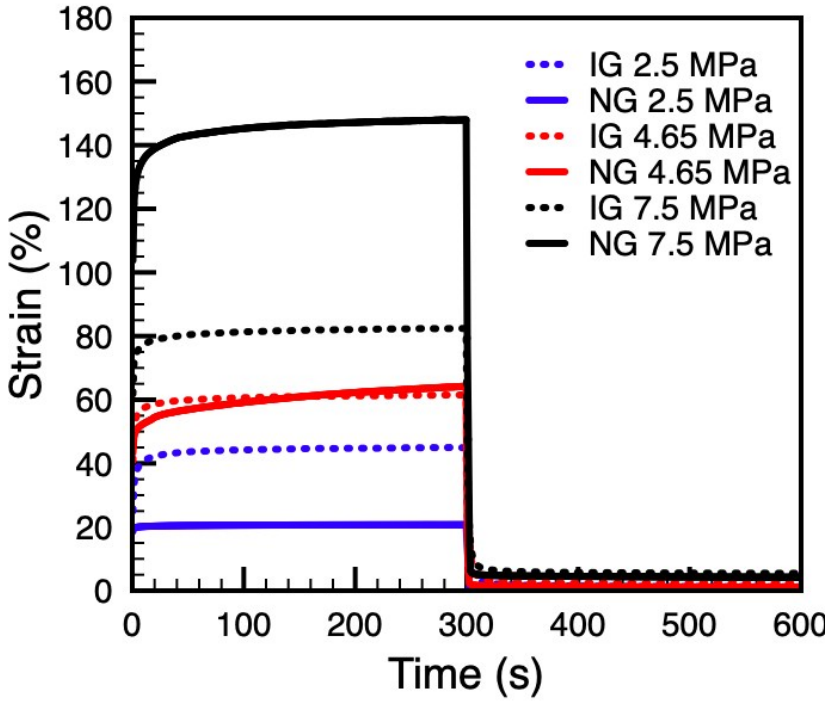

Figure S8: Creep recovery tests for C11M/TMPTMP at stress values (inset). Stresses were applied for 5 minutes, and the material was allowed to relax for 5 more minutes.

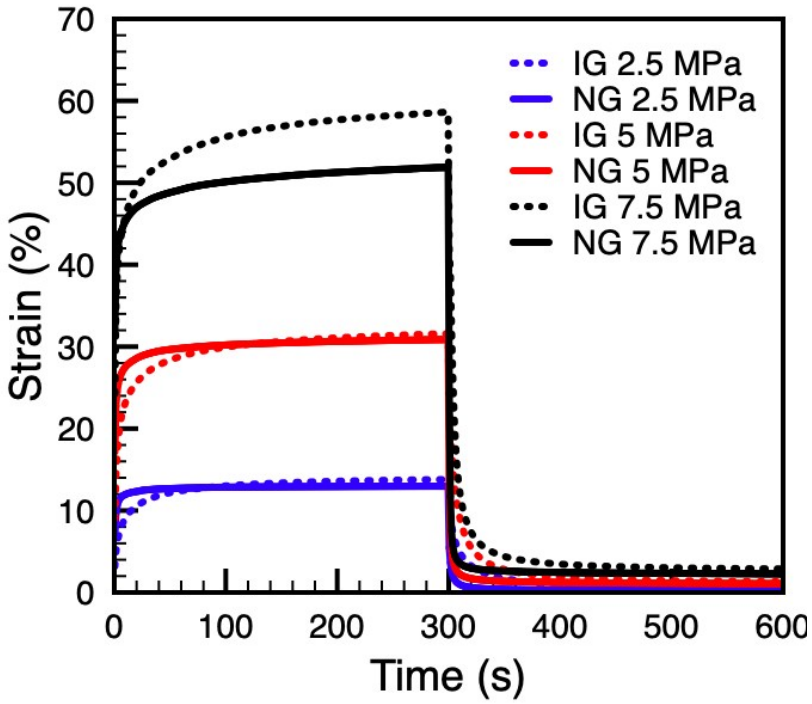

Figure S9: Creep recovery tests for C11M/PETMP at stress values (inset). Stresses were applied for 5 minutes, and the material was allowed to relax for 5 more minutes.

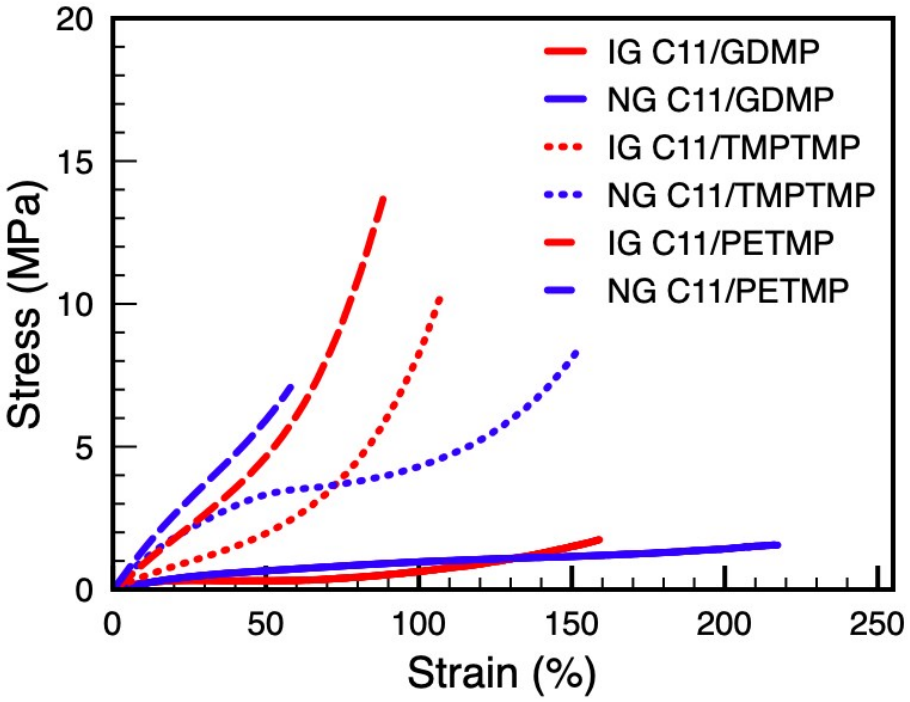

Figure S10: Stress-strain curves from IG and NG polydomain LCEs prepared from the two stage photopolymerization process. Strips were cut from each side of a film patterned as half IG, half NG.

Figure S11: (left) The microvice tensile holder and (right) a representative image of a sample during DIC analysis.

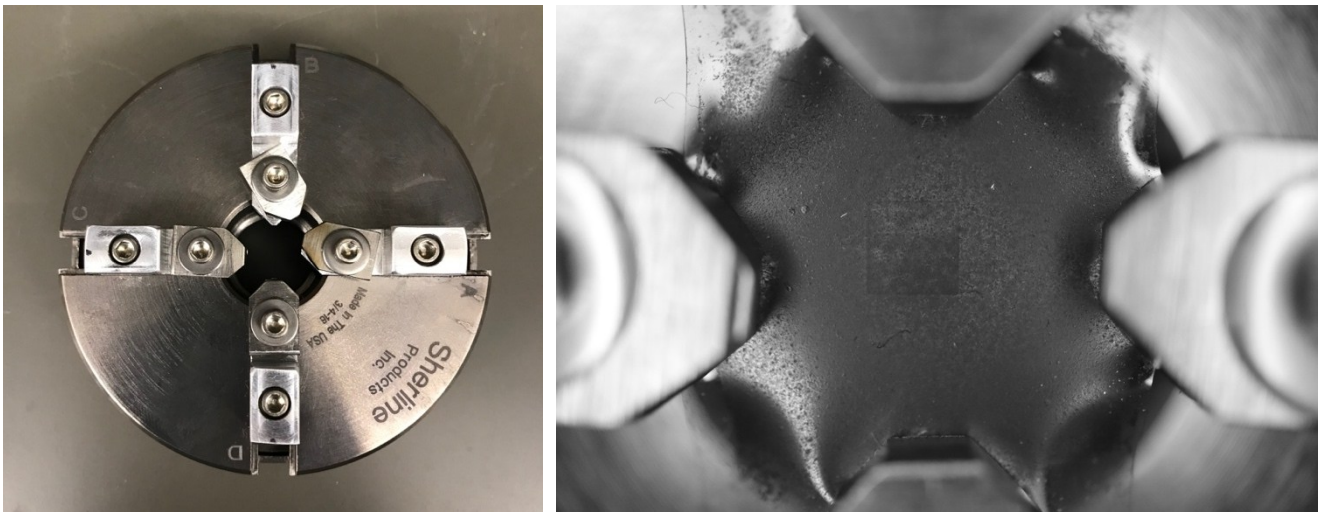

Figure S12: (left) The biaxial stretcher, composed of a lathe chuck equipped with toe clamps. (Right) a representative image of a sample used for DIC analysis.