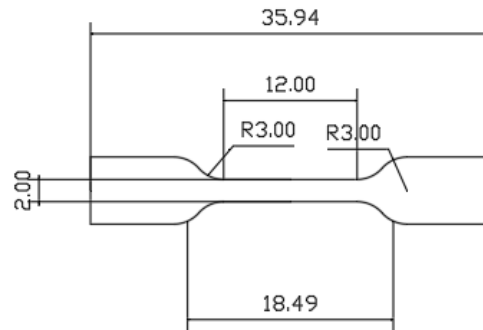
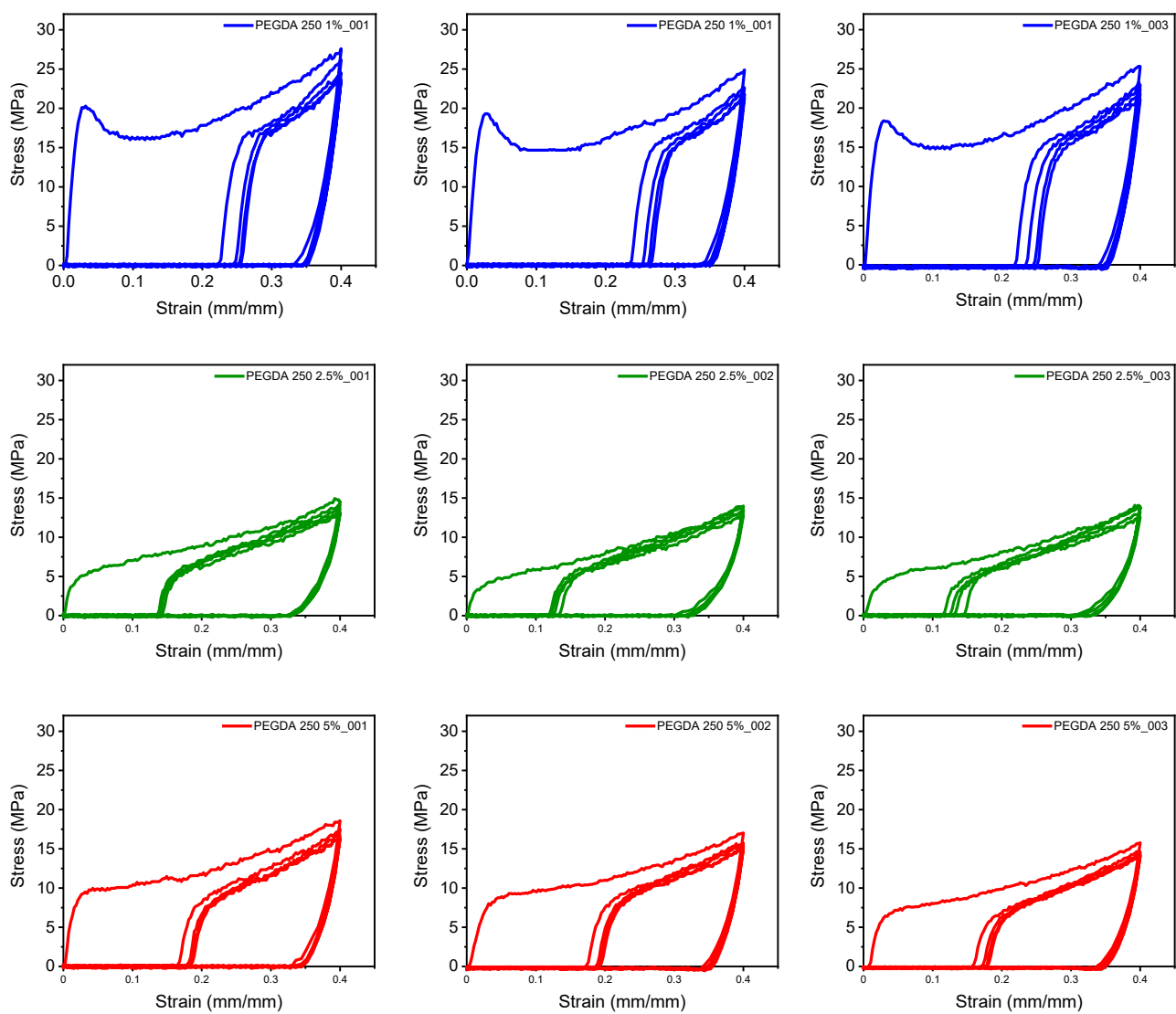


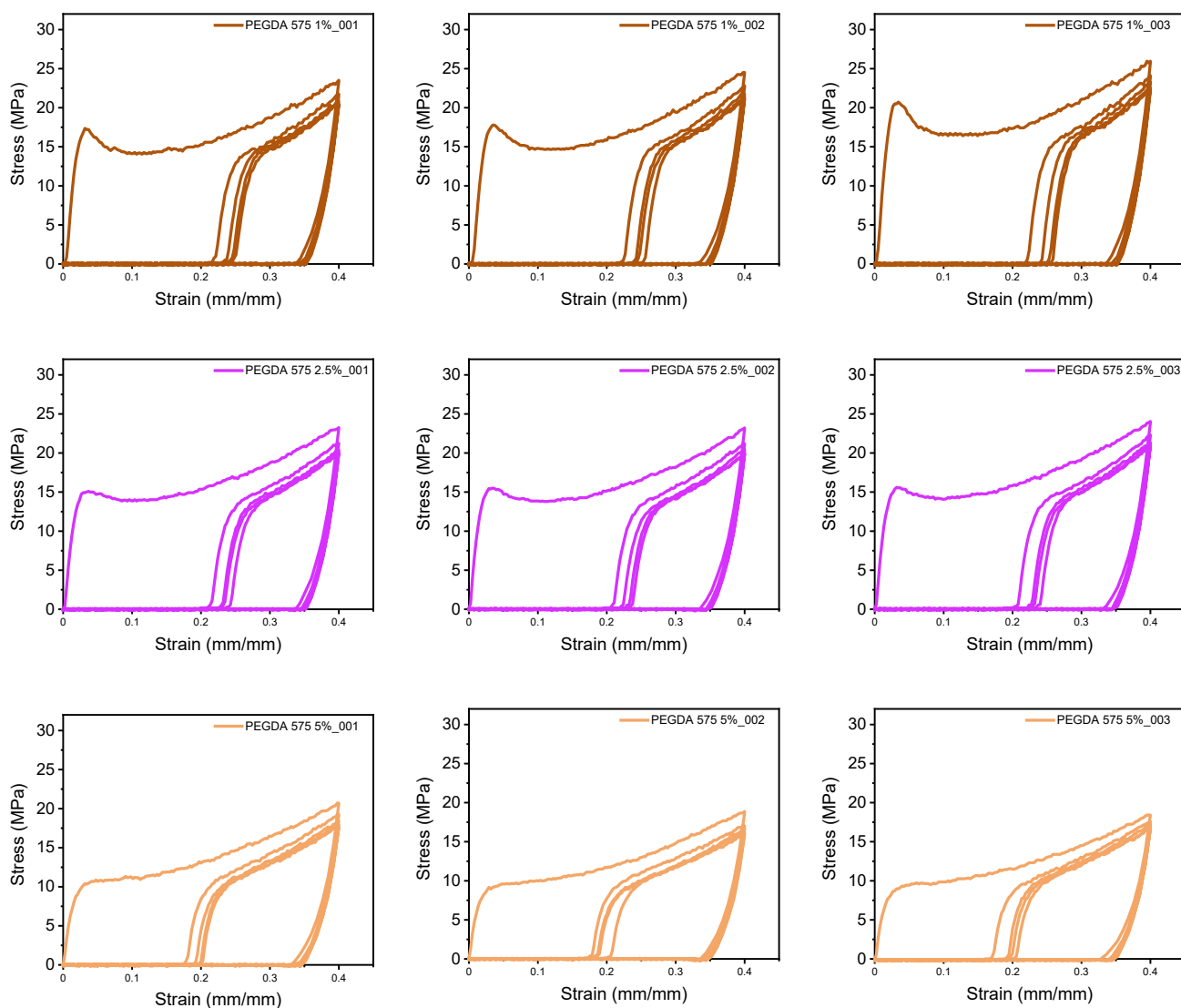
## Mechanical tensile testing



**Figure S1.** Specimen dimensions per ISO 572-2 (5B) for tensile testing. All dimensions are in mm.



**Figure S2.** Cyclic testing of 3 replicates of each polymer composition with PEGDA 250 (Strain to 40%).



**Figure S3.** Cyclic testing of 3 replicates of each polymer composition with PEGDA 575 (Strain to 40%).

# Thermomechanical Test

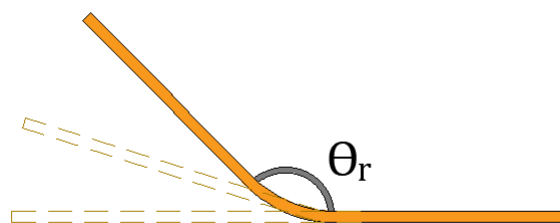
**Table S1.** Comparison of  $T_g$  and storage modulus at different temperatures for different polymer compositions in dry condition.

Polymer Composition	$T_g$ (°C) (Dry)	Glassy modulus at $<T_g$ (10 °C) (MPa)	Storage Modulus at 37 °C (MPa)	Rubbery modulus at $>T_g$ (50 °C) (MPa)
TATATO/TMTMP	31.2 ± 1.7	1711.4 ± 277.7	31.0 ± 7.6	16.4 ± 5.1
PEGDA 250 1%	29.7 ± 0.4	2282.5 ± 120.5	26.5 ± 2.2	12.5 ± 1.1
PEGDA 250 2.5%	28.7 ± 1.0	2114.05 ± 46.7	21.1 ± 3.3	11.76 ± 3.7
PEGDA 250 5%	27.0 ± 0.03	2138.3 ± 34.7	20.8 ± 0.4	11.7 ± 0.4
PEGDA 575 1%	29.2 ± 0.3	1876.04 ± 87.9	17.7 ± 3.2	9.2 ± 2.7
PEGDA 575 2.5%	28.0 ± 0.6	3425.9 ± 2119	36.1 ± 22.9	19.7 ± 16.6
PEGDA 575 5%	26.0 ± 0.6	1839 ± 90.3	18.3 ± 0.6	12.4 ± 1.3

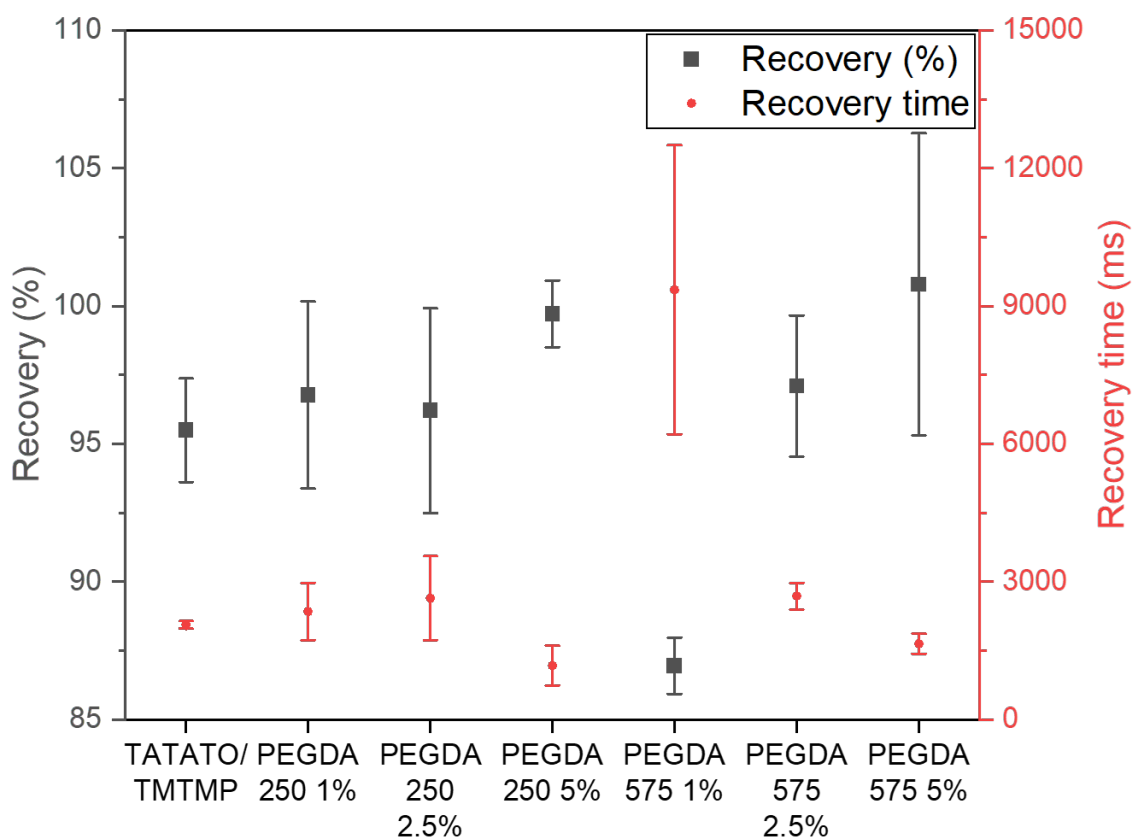
**Table S2.** Comparison of  $T_g$  and storage modulus at different temperatures for different polymer compositions in soaked condition.

Polymer Composition	$T_g$ (°C) (Soaked)	Glassy Modulus $<T_g$ (10 °C) (MPa)	Storage Modulus at 37 °C (MPa)	Rubbery Modulus $>T_g$ (50 °C) (MPa)
TATATO/TMTMP	21.8 ± 0.5	1374.5 ± 44.7	13.1 ± 0.02	13.5 ± 4.4
PEGDA 250 1%	21.1 ± 0.8	1384.9 ± 167.0	12.8 ± 6.4	11.6 ± 5.3
PEGDA 250 2.5%	21.4 ± 0.8	1370.9 ± 100.2	11.9 ± 4.4	12.0 ± 5.1
PEGDA 250 5%	18.8 ± 0.6	943.6 ± 64.4	11.3 ± 4.4	11.7 ± 4.7
PEGDA 575 1%	22.0 ± 0.1	1437.7 ± 31.3	9.3 ± 6.2	9.1 ± 6.6
PEGDA 575 2.5%	20.4 ± 0.4	1224.3 ± 121.4	13.0 ± 3.0	10.3 ± 1.1
PEGDA 575 5%	17.4 ± 0.4	708.4 ± 101.1	7.9 ± 5.7	8.2 ± 3.0

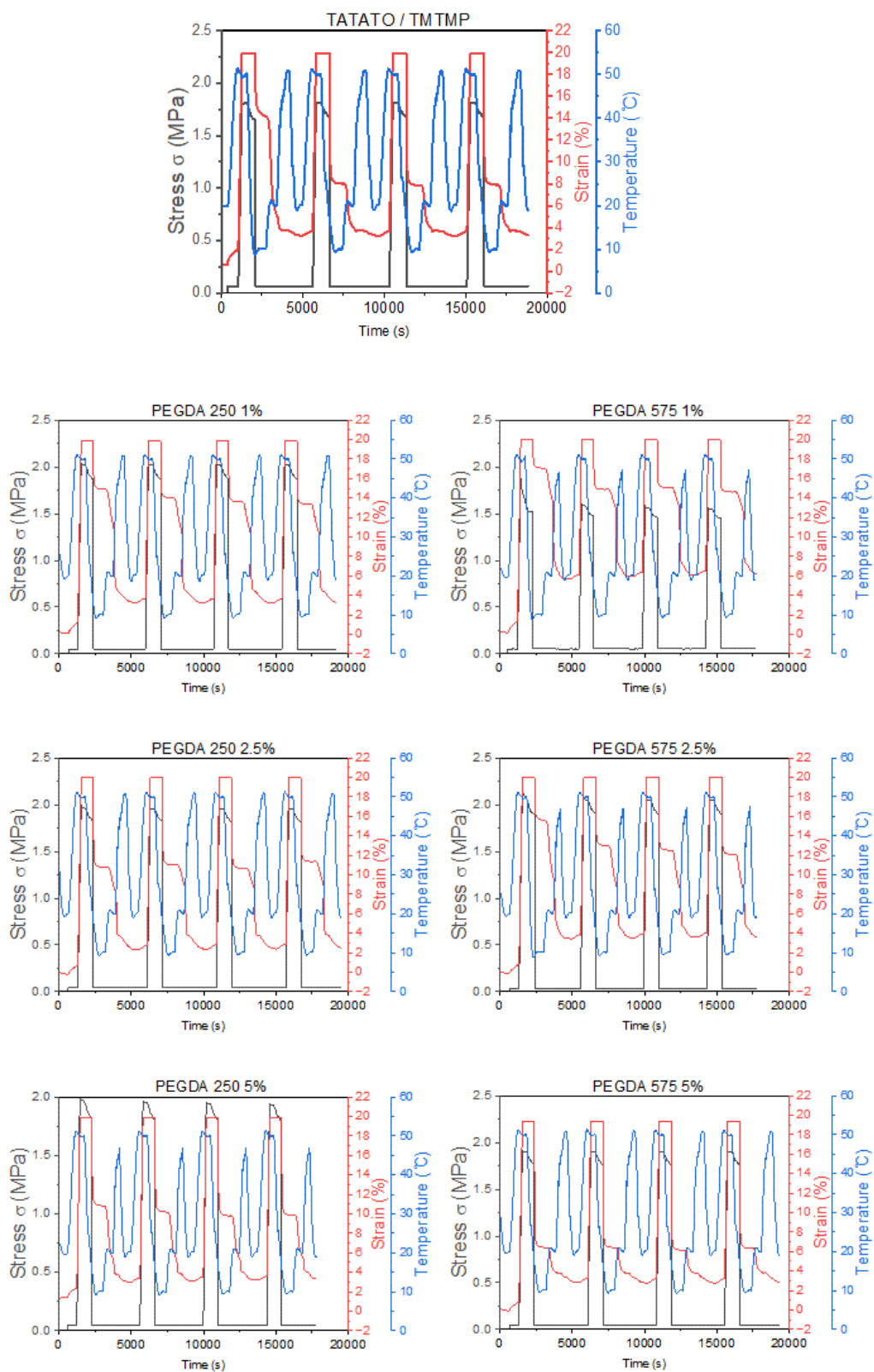
## Shape Memory Characterization



**Figure S4.** Shape recovery mechanism of the polymer.  $\theta_r$  represents the shape recovery angle for the calculation of shape recovery %.



**Figure S5.** Qualitative SMP analysis. Plot demonstrating the shape recovery % and recovery time for all the polymer compositions. .



**Figure S6.** Representative shape memory test data results from DMA 850 for all the polymer groups.

**Table S3.** Calculation of shape fixity and shape recovery for the first and second cycle.

	TATATO / TMTMP		PEGDA 250 1%		PEGDA 250 2.5%		PEGDA 250 5%		PEGDA 575 1%		PEGDA 575 2.5%		PEGDA 575 5%	
	1st cycle	2nd cycle	1	2	1	2	1	2	1	2	1	2	1	2
L_unload at 10	17.904	16.8783	17.9295	17.7905	17.1762	17.2131	18.2578	18.1545	21.1188	20.7227	19.3958	18.9574	16.448	16.447
L_unload at 20	16.4887	16.2876	17.5121	17.413	16.8377	16.9353	17.4097	17.3938	20.6108	20.4415	18.4389	18.3287	16.0712	16.0638
L_max	18.7332	18.7332	18.7025	18.7025	18.6033	18.6033	19.7504	19.7504	21.646	21.646	20.1341	20.1341	18.4559	18.4559
L recovered at 20	16.1346	16.1313	16.1123	16.1077	15.8611	15.8696	16.9715	16.9886	19.0662	19.1154	17.358	17.3741	15.8932	15.8875
L initial at 20	15.7598	16.1304	15.6252	16.1123	15.4704	15.8611	16.7189	16.9715	18.0857	19.0627	16.7657	17.3522	15.4593	15.8889

Cycle to cycle

Fixity @10C 95.573634 90.09833 95.86686 95.12365 92.32878 92.52713 92.44268 91.91966 97.56445 95.73455 96.33309 94.15569 89.12055 89.115134

Recovery @ 20C 87.394901 99.96542 84.17119 100.1776 87.52913 99.69003 91.66749 99.38465 72.46019 97.95997 82.41598 99.21277 85.52026 100.05454