Supporting Information

Chemically Debondable, High-strength and Tough Adhesives from Sulfur Modified Epoxy Networks

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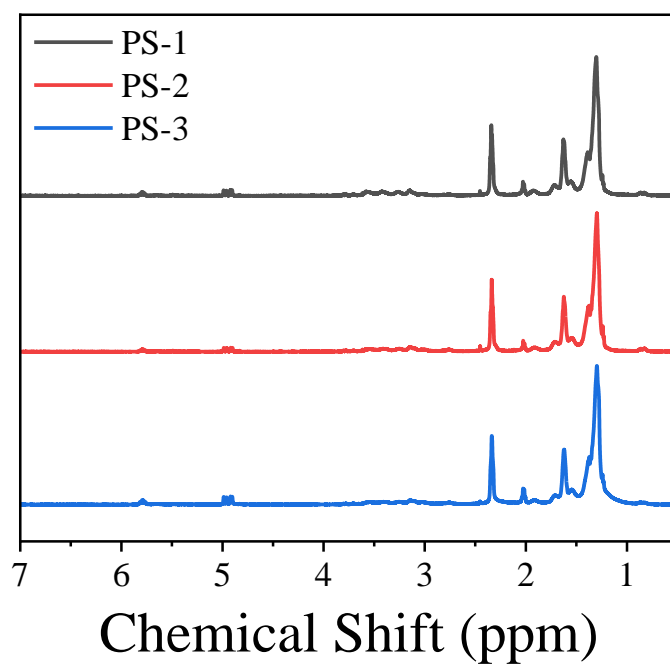Email: yuanliang2020@ahau.edu.cn
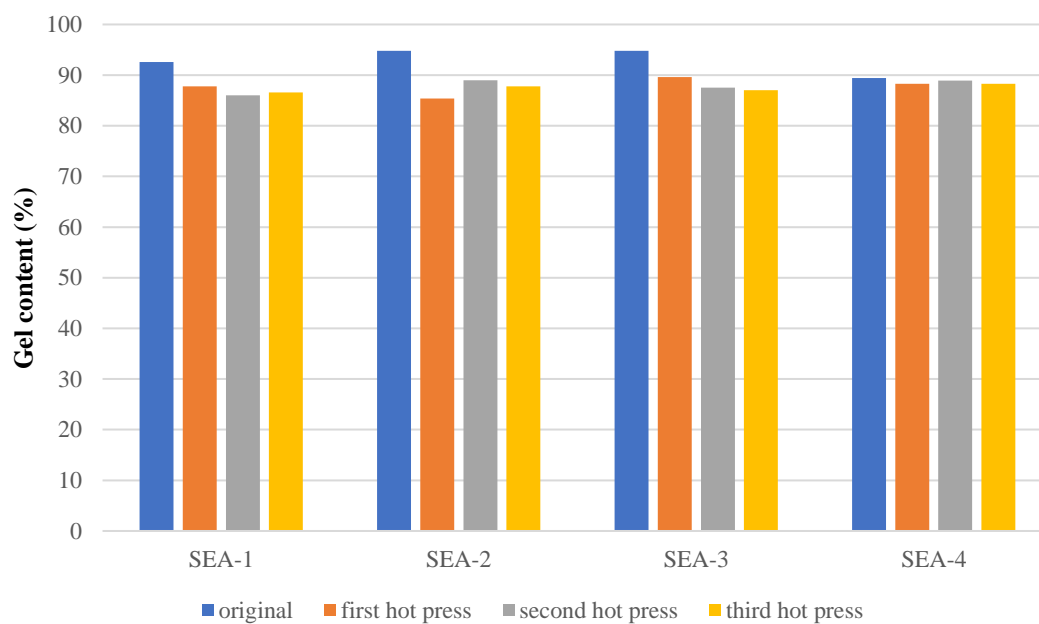
Fig. S1. ^{1}H NMR spectrum of PS samples.

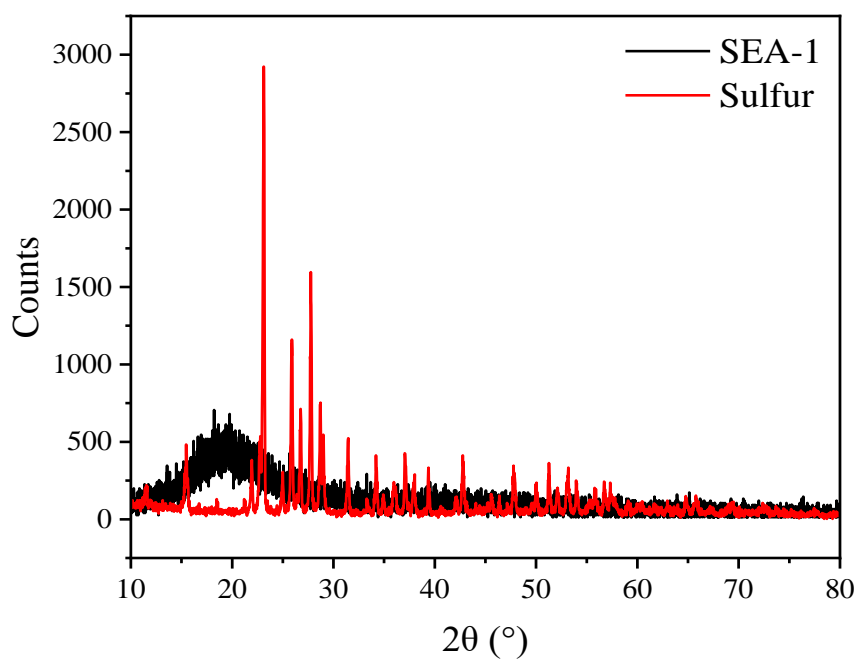**Fig. S2**. Insoluble contents of SEA as-prepared samples and after each hot-pressing cycle.

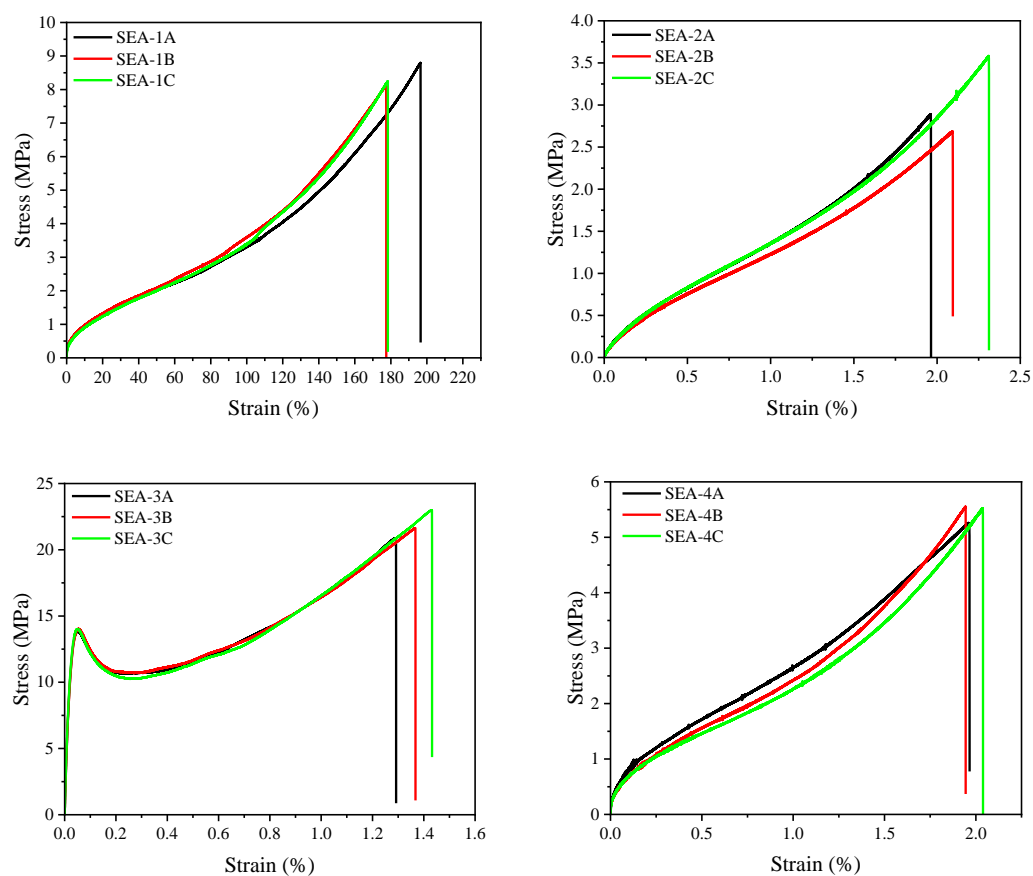**Fig. S3.** XRD spectrum of sulfur and SEA-1.

Fig. S4. Tensile testing results of SEA samples.

Table S1. Tensile test results of SEA samples.

Sample	Strain at break A [%]	Strain at break B [%]	Strain at break C [%]	Mean value [%]	Standard deviation [%]	Stess at break A [MPa]	Stess at break B [MPa]	Stess at break C [MPa]	Mean value [MPa]	Standard deviation [MPa]
SEA-1	196.54	177.47	178.36	184.12	10.76	8.79	8.11	8.24	8.38	0.36
SEA-2	196.37	209.47	231.21	212.35	17.59	2.89	2.68	3.58	3.05	0.47
SEA-3	129.22	136.76	143.22	136.40	7.01	20.88	21.64	22.99	21.84	1.07
SEA-4	196.56	194.45	203.94	198.32	4.98	5.26	5.55	5.53	5.45	0.16

Table S2. Collected tensile test results for plotting Fig. 3D and the references.

Reference number in Fig. 3D	Strain at break (%)	Stress at break (MPa)	References
S1	1.63	19.5	
	2.33	9.43	ACS Macro Lett., 2016, 5, 1152−1156.
	228.33	2.33	(DOI: 10.1021/acsmacrolett.6b00602)
	1.27	10.1	
S2	280	1.38	
	320	0.44	ACS Appl. Polym. Mater., 2020, 2, 5173−5178.
	430	0.13	(DOI:10.1021/acsapm.0c00924)
S3	2.8	17.5	
	7.9	6.9	ACS Macro Lett., 2015, 4, 862−866.
	9.8	12.9	(DOI: 10.1021/acsmacrolett.5b00502)
S4	7.19	0.25	
	8.28	0.59	
	9.94	0.74	Adv. Funct. Mater., 2019, 1808989.
	9.11	0.85	(DOI: 10.1002/adfm.201808989)
	9.94	1.01	
	7.77	1.06	
S5	19	2.1	
	20	1.68	J. Mater. Chem. A, 2019, 7, 15683-15690.
	17	1.43	(DOI: 10.1039/c9ta03222c)
S6	32	22	Macromol. Rapid Commun., 2017, 38, 1700051.
			(DOI:10.1002/marc.201700051)
S7	45	0.93	Chem. Eur. J., 2019, 25, 10433-10440.
	27	0.97	(DOI:10.1002/chem.201901619)
S8	35.28	0.14	
	51.2	0.59	
	42.06	1.88	Angew. Chem. Int. Edit., 2020, 59, 13371-13378.
	15.08	9.64	(DOI:10.1002/anie.202004311)
	11.85	20.17	
S9	0.88	5	

	1.14	3.9	ACS Appl. Polym. Mater., 2020, 2, 3761−3765.
	0.76	4.08	(DOI:10.1021/acsapm.0c00803)
S10	22	1.92	J. Polym. Sci., 2020, 58, 438–445.
	18	1.6	(DOI: 10.1002/pol.20190138)
S11	21.5	2.6	Sustain. Chem. Pharm., 2020, 16, 100249.
	25.7	1.5	(DOI:10.1016/j.scp.2020.100249)
S12	1.7	7	RSC Adv., 2019, 9, 31460–31465 (DOI: 10.1039/c9ra06213k)
S13	47.67	1.3	Mater Lett.,2017,203,58-61. (DOI:10.1016/j.matlet.2017.05.133)
	71.46	2	
	53.62	6.1	
S14	72	3.85	Polymers, 2017, 9, 59.
	50	2.1	(DOI:10.3390/polym9020059)
S15	32	2.9	J Polym Sci., 2020, 58, 2943–2950. (DOI: 10.1002/pol.20200521)
	98	1.21	
	32	3.7	
S16	167.3	6.36	Chem. Mater. 2022, 34, 1167−1178.
	113.28	13.21	(DOI:10.1021/acs.chemmater.1c03662)
S17	3.44	60.44	Chem. Sci., 2022, 13, 566–572.
	17	13.55	(DOI: 10.1039/d1sc05896g)

Table S3. Component ratios of control studies for SEA-1.

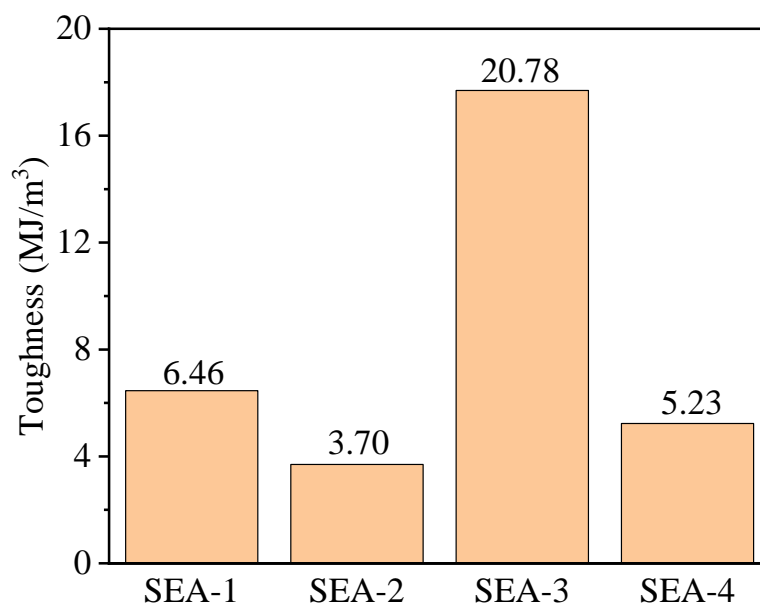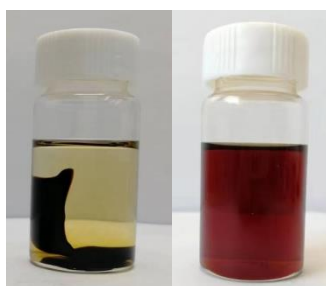| Sample	Sulfur [g]	10-undecenoic acid [g]	DGEBA [g]	Oleic acid [g]	1-Dodecene [g]	Zinc diethyl-dithiocarbamate [mg]
SEA-1	1.0	2.0	3.0	0	0	0
C-1	1.0	0	3.0	2.0	0	0
C-2	1.0	2.0	3.0	0	0	60.0
C-3	1.0	0	3.0	0	0	0
C-4	1.0	0	3.0	0	2	0

Fig. S5. Toughness calculation for SEA curves given in Fig. 3A.

Fig. S6. Solubility test of C-1 in DMF, 1 minute after putting the film in DMF (left) and 12 hours later (right).
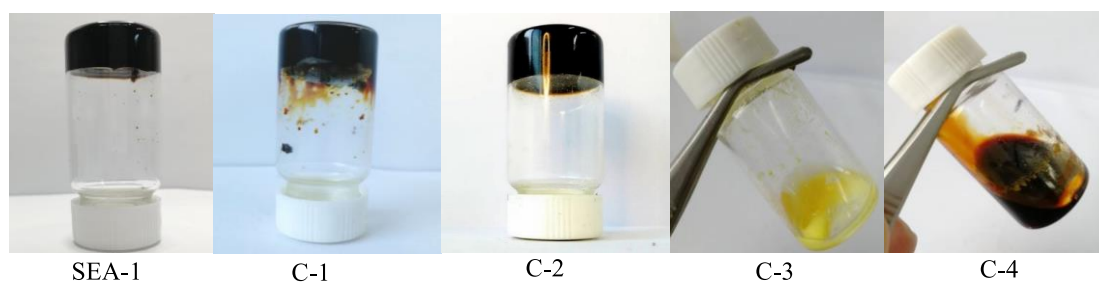

| SEA-1 | C-1 | C-2 | C-3 | C-4 |

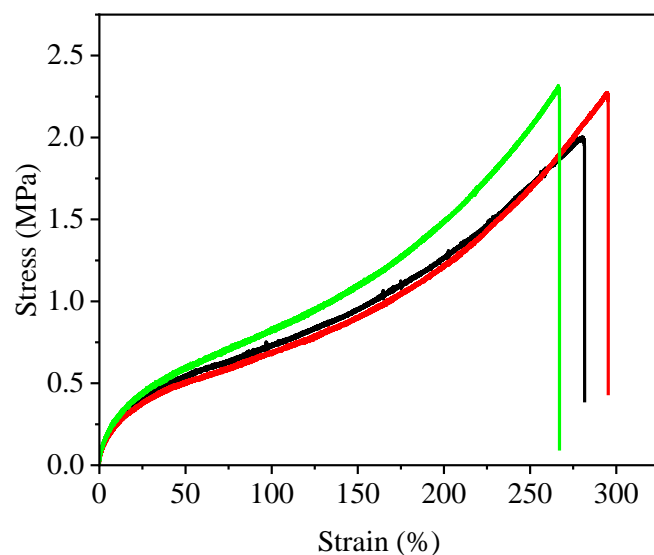**Fig. S7.** Photo of SEA-1 and other samples from the control studies.

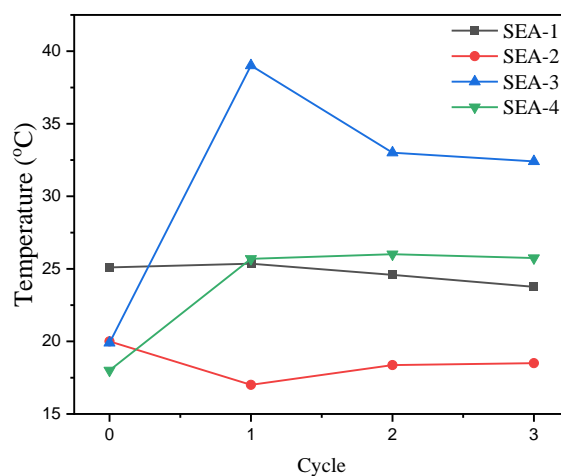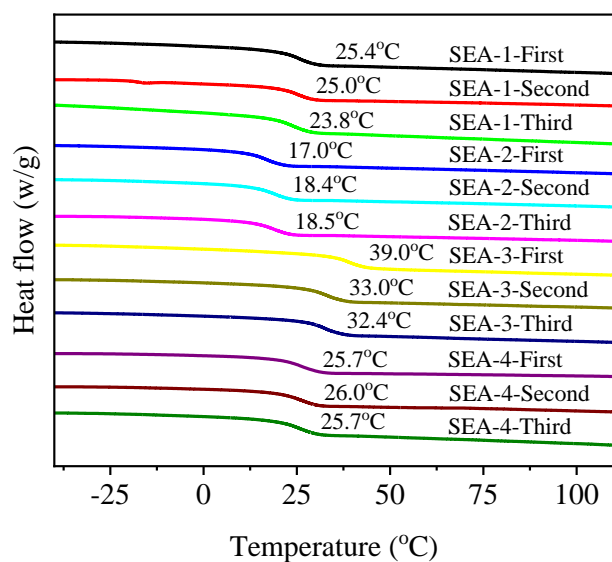**Fig. S8.** Tensile testing results of control sample C-2.

Fig. S9. DSC thermograms of SEA samples after different cycles of hot-pressing (TOP) and summarized T_g in comparison with the as-prepared sample (bottom).
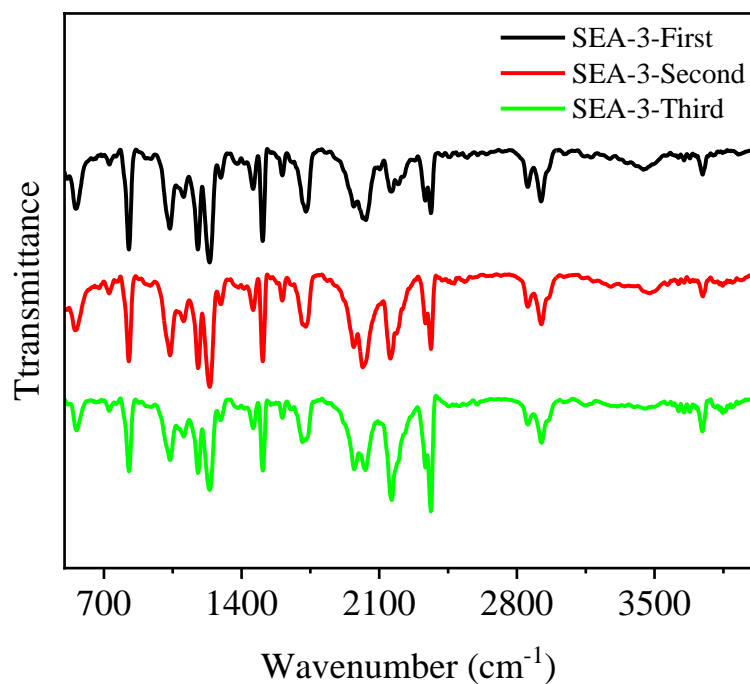
Fig. S10. FT-IR spectrum of SEA-3 samples after each hot-pressing cycle.

Table S4. Summary of lap shear strength (LSS) testing results for SEA samples and SK-13.

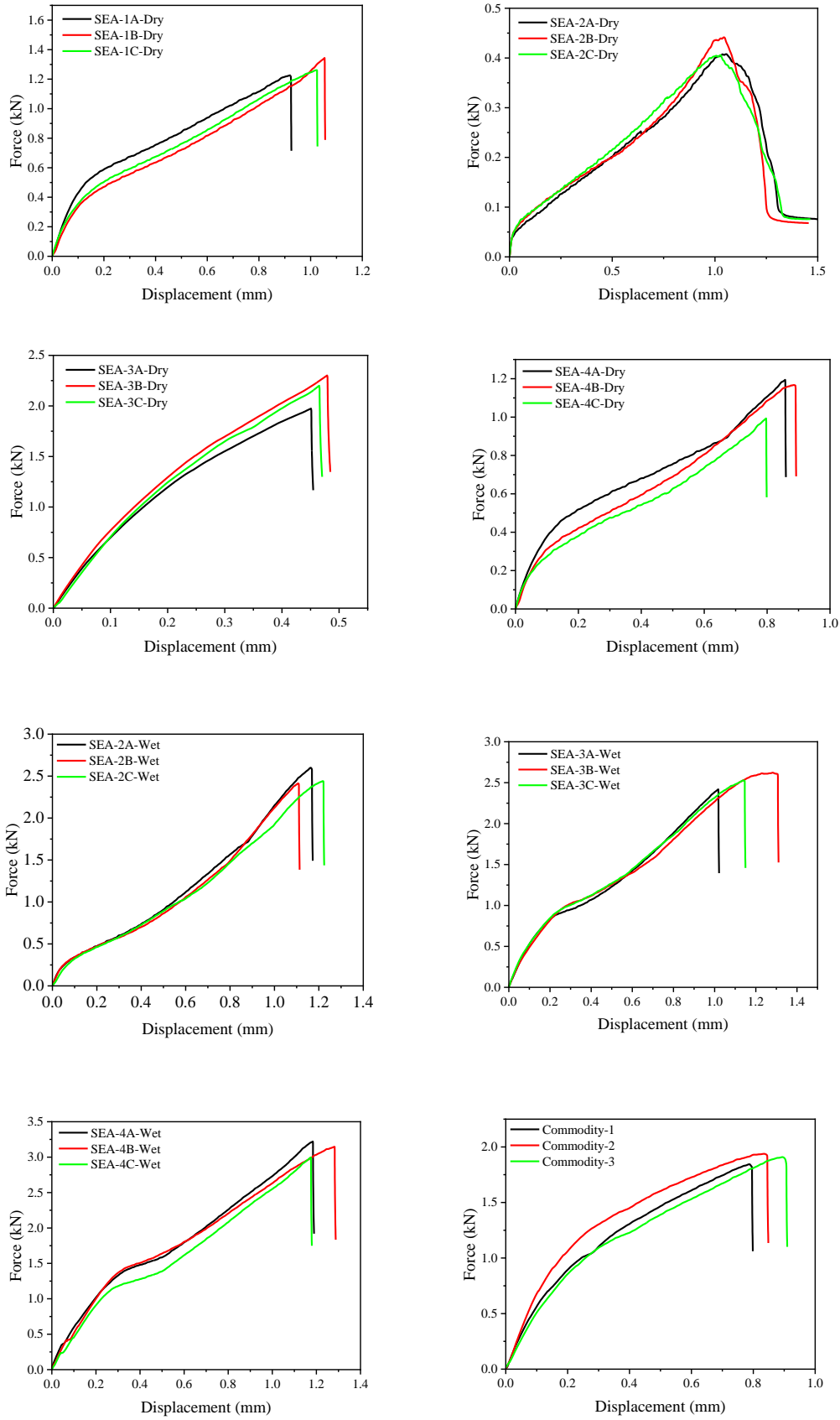| Sample	LSS [MPa] A	LSS [MPa] B	LSS [MPa] C	Mean value [MPa]	Standard deviation [MPa]
SEA-1-Wet	33.31	28.14	32.58	31.34	2.79
SEA-2-Wet	25.99	24.12	24.40	24.84	1.01
SEA-3-Wet	24.19	26.22	25.26	25.23	1.01
SEA-4-Wet	32.21	31.46	29.97	31.22	1.14
SEA-1-Dry	12.26	13.43	12.62	12.77	0.61
SEA-2-Dry	4.07	4.41	4.05	4.18	0.20
SEA-3-Dry	19.74	23.01	22.01	21.58	1.67
SEA-4-Dry	11.94	11.67	9.93	11.18	1.09
SK-13	18.43	19.38	19.08	18.96	0.48

Fig. S11. Load displacement curves of SEA samples and commodity epoxy adhesive SK-13 during the lap shear strength testing. For all testing specimens, the overlapping area is 10 mm x 10 mm.
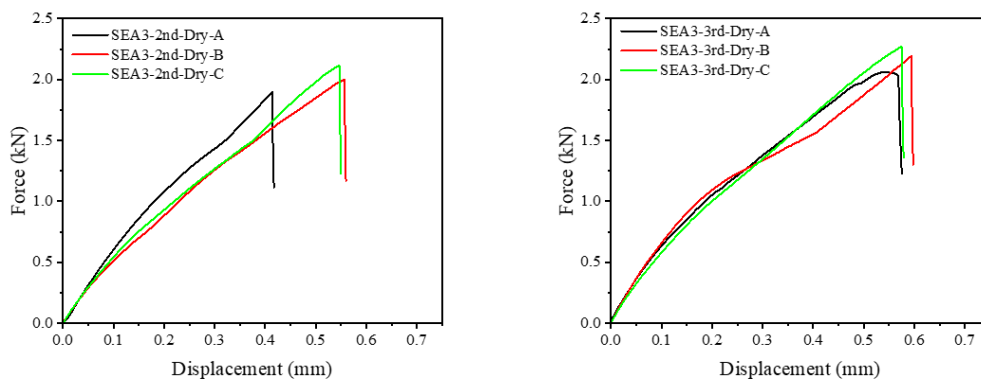
Fig. S12. Dry adhesive bonding test for reprocessed SEA-3 films after the second (left) and third (right) cycle.
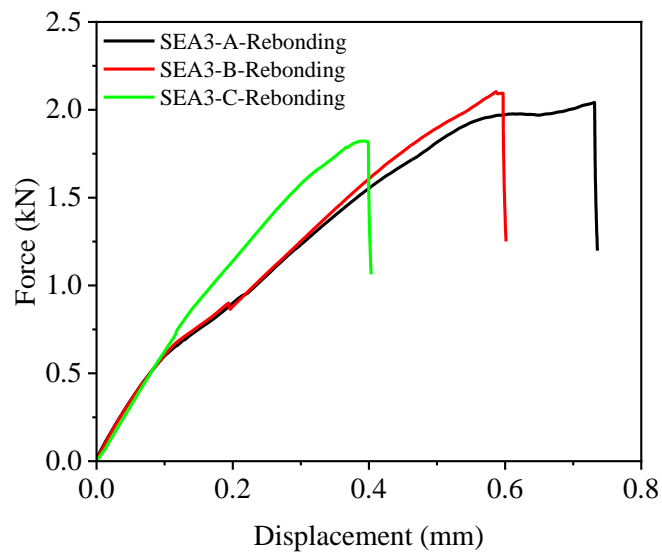

Fig. S13. SEA-3 dry adhesive re-bonding test.