

# From Poly(glycerol itaconate) Gels to Novel Nonwoven Materials for Biomedical Applications

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**Figure S1.** The consistency of the obtained PGLtc product.

**Table S1.** The weight of the non-crosslinked nonwovens before and after leaching.

OH/C OOH ratio	PGItc:PL A ratio	Weight before leaching [mg]	Weight after leaching [mg]	Loss of mass [mg]	%Loss of mass	Average %Loss of mass	Average %standard deviation of mass
0.5	75:25	2.37	0.71	1.66	70	70	1.5
		2.04	0.59	1.45	71		
		2.39	0.76	1.63	68		
	50:50	2.35	1.25	1.10	47	49	3.0
		2.27	1.11	1.16	51		
		2.12	1.02	1.10	52		
	25:75	3.99	2.90	1.09	27	27	0.5
		5.03	3.70	1.33	26		
		4.41	3.24	1.17	27		
1	75:25	8.31	2.32	5.99	72	71	1.0
		15.67	4.59	11.08	71		
		9.23	3.04	6.19	67		
	50:50	5.07	2.45	2.62	52	48	3.7
		4.08	2.15	1.93	47		
		7.98	4.45	3.53	44		
	25:75	1.63	1.13	0.50	31	31	0.8
		2.09	1.45	0.64	31		
		1.90	1.29	0.61	32		
1.5	75:25	5.03	3.70	1.33	26	69	1.4
		4.41	3.24	1.17	27		
		6.79	1.98	4.81	71		
	50:50	1.14	0.67	0.47	41	43	1.9
		3.10	1.77	1.33	43		
		1.31	0.72	0.59	45		
	25:75	2.55	1.73	0.82	32	33	2.1
		1.74	1.13	0.61	35		
		1.78	1.23	0.55	31		

**Table S2.** The weight of the crosslinked nonwovens before and after leaching.

OH/C OOH ratio	PGItc:PL A ratio	Weight before leaching [mg]	Weight after leaching [mg]	Loss of mass [mg]	%Loss of mass	Average %Loss of mass	Average %standard deviation of mass
0.5	75:25	1.40	1.20	0.20	14.29	21.82	6.57
		3.99	3.00	0.99	24.81		
		4.02	2.96	1.06	26.37		
	50:50	1.27	1.13	0.14	11.02	13.85	3.69
		1.11	0.91	0.20	18.02		
		0.64	0.56	0.08	12.50		
	25:75	3.48	3.38	0.10	2.87	2.68	0.61
		2.83	2.74	0.09	3.18		
		1.00	0.98	0.02	2.00		
1	75:25	9.80	8.35	1.45	14.80	14.32	1.66
		12.17	10.26	1.91	15.69		
		11.70	10.24	1.46	12.48		
	50:50	1.20	1.12	0.08	6.67	8.48	4.05
		2.44	2.12	0.32	13.11		
		2.48	2.34	0.14	5.65		
	25:75	0.89	0.87	0.02	2.25	1.82	0.47
		1.52	1.50	0.02	1.32		
		1.05	1.03	0.02	1.90		
1.5	75:25	2.44	1.84	0.60	24.59	19.61	4.91
		2.30	1.96	0.34	14.78		
		3.03	2.44	0.59	19.47		
	50:50	3.04	2.47	0.57	18.75	19.21	0.44
		2.96	2.39	0.57	19.26		
		6.93	5.57	1.36	19.62		
	25:75	2.33	2.26	0.07	3.00	2.82	0.80
		1.99	1.92	0.07	3.52		
		2.06	2.02	0.04	1.94		

**Table S3.** Characteristic temperatures and enthalpies for PGI<sub>tc</sub>-PLA non-crosslinked and crosslinked nonwovens.

Compared parameter	PGI <sub>tc</sub> :PLA ratio	OH/COOH ratio					
		Non-crosslinked nonwoven			Crosslinked nonwoven		
		0,5	1	1,5	0,5	1	1,5
T <sub>g1</sub> [°C]	25:75	2.8	-6.2	-23.2	-	-	-
	50:50	-2.3	-12.1	4.6	-	-	-
	75:25	2.1	-5.1	-10.3	-	-	-
T <sub>g1'</sub> [°C]	25:75	51.4	54.5	51.3	49.2	51.4	35.8
	50:50	58.1	58.3	55.2	53.0	52.1	42.2
	75:25	55.9	59.6	52.3	58.1	32.0	35.3
T <sub>g2</sub> [°C]	25:75	61.9	62.4	-	61.0	61.9	61.3
	50:50	63.0	62.6	63.0	62.1	60.6	56.1
	75:25	-	63.5	61.8	-	61.1	53.4
T <sub>cc1</sub> [°C]	25:75	71.0 (12.8 J/g)	71.5 (11.4 J/g)	70.0 (10.4 J/g)	-	-	-
	50:50	76.4 (22.8 J/g)	75.4 (15.2 J/g)	74.8 (13.5 J/g)	-	-	-
	75:25	76.6 (8.2 J/g)	79.1 (7.8 J/g)	75.4 (8.8 J/g)	-	-	-
T <sub>cc2</sub> [°C]	25:75	107.6 (19.1 J/g)	104.5 (10.9 J/g)	-	103.5 (20.7 J/g)	106.4 (7.7 J/g)	101.0 (0.8 J/g)
	50:50	108.1 (7.1 J/g)	-	108.6 (7.3 J/g)	103.0 (2.9 J/g)	101.8 (5.4 J/g)	101.6 (6.0 J/g)
	75:25	-	112.1 (7.4 J/g)	99.3 (3.6 J/g)	105.2 (3.3 J/g)	103.3 (13.7 J/g)	104.5 (7.8 J/g)
T <sub>cc3</sub> [°C]	25:75	99.5 (7.0 J/g)	102.3(5.3 J/g)	108.8 (29.1 J/g)	99.9 (5.8 J/g)	-	105.5 (30.2 J/g)
	50:50	103.1 (6.1 J/g)	131.1 (1.3 J/g) *105.1 (5.1 J/g)	101.9 (9.7 J/g)	102.7 (21.2 J/g)	104.1 (10.5 J/g)	106.6 (16.2 J/g)
	75:25	107.9 (15.4 J/g)	-	103.1 (7.6 J/g)	100.8 (5.4 J/g)	100.7 (8.5 J/g)	-
T <sub>c2</sub> [°C]	25:75	162.2 (4.8 J/g)	161.5 (6.5 J/g)	-	158.5 (11.3 J/g)	161.0 (1.1 J/g)	-
	50:50	163.2 (2.1 J/g)	162.9 (1.9 J/g)	163.7 (5.6 J/g)	161.5 (1.7 J/g)	158.2 (2.0 J/g)	-
	75:25	-	165.2 (1.3 J/g)	162.8 (3.4 J/g)	163.6 (3.3 J/g)	156.1 (1.7 J/g)	-
T <sub>m1</sub> [°C]	25:75	181.5 (40.0 J/g)	181.9 (38.4 J/g)	177.7 (39.7 J/g)	180.0 (50.0 J/g)	176.5 (10.2 J/g)	178.0 (40.6 J/g)
	50:50	176.1 (30.3 J/g)	177.5 (31.6 J/g)	178.3 (30.3 J/g)	176.8 (31.2 J/g)	179.2 (30.2 J/g)	179.3 (24.3 J/g)
		**180.6 (27.8 J/g)	**181.6 (31.1 J/g)				

	75:25	177.1 (14.9 J/g)	176.7 (12.9 J/g)	176.7 (16.9 J/g)	176.4 (18.4 J/g)	179.3 (38.1 J/g)	175.7 (11.4 J/g)
T <sub>m2</sub> [°C]	25:75	179.2 (34.1 J/g)	177.7 (28.5 J/g)	175.9 (35.3 J/g)	174.0 (38.1 J/g)	172.7 (11.2 J/g)	167.9 (34.0 J/g)
	50:50	178.2 (25.6 J/g)	177.8 (24.6 J/g)	178.4 (25.7 J/g)	175.8 (27.3 J/g)	171.2 (22.6 J/g)	159.3 (22.4 J/g)
	75:25	178.6 (14.7 J/g)	177.7 (13.3 J/g)	175.9 (12.5 J/g)	176.4 (9.7 J/g)	169.4 (31.6 J/g)	153.3 (8.2 J/g)

The standard error of the determined enthalpy value for crosslinked samples was 2% from the enthalpy value obtained for uncrosslinked and crosslinked samples. The results marked in **black** are within the limits of the standard error. The results outside the limits of the standard error are marked in **gray**. In most cases, the values of the determined enthalpies for the tested samples are beyond the standard error which was assumed earlier. It means that the crosslinking of the samples affects the thermal properties of the tested nonwovens.

Where:

T<sub>g1</sub> – First glass transition temperature during first heating (midpoint temperature);

T<sub>g1'</sub> – Second glass transition temperature during first heating (midpoint temperature);

T<sub>g2</sub> - Glass transition temperature during second heating (midpoint temperature);

T<sub>cc1</sub> – Cold crystallization temperature during first heating (peak temperature);

T<sub>cc2</sub> – Cold crystallization temperature during second heating (peak temperature);

T<sub>c2</sub> – Crystallization temperature during second heating (peak temperature);

T<sub>cc</sub> - Cold crystallization temperature during cooling (peak temperature);

T<sub>m1</sub> - Melting temperature during first heating (peak temperature);

T<sub>m2</sub> - Melting temperature during second heating (peak temperature);

\*Second cold crystallization temperature during cooling (peak temperature);

\*Second melting temperature during first heating (peak temperature).

Values for the enthalpy of cold crystallization ( $\Delta H_{cc1}$ ,  $\Delta H_{cc2}$ ), enthalpy of cold crystallization during cooling ( $\Delta H_{cc}$ ) and enthalpy of melting ( $\Delta H_{m1}$ ,  $\Delta H_{m2}$ ) of investigated nonwovens are shown in brackets. The enthalpy values were determined by the onset method.

In order to determinate the degree of crystallinity of the samples, a following formula was used:

$$X_c = (\Delta H_{m1 \text{ or } 2} / \Delta H_m^\circ) \times 100\% \quad [\%] \quad (1)$$

Where  $\Delta H_m^\circ$  is the specific enthalpy of melting of 100% crystalline PLA (93 J/g).

**Table S4.** Degree of crystallinity of the samples after first heating [%].

PGItc:PLA ratio	OH/COOH ratio					
	Non-crosslinked nonwoven			Crosslinked nonwoven		
	0.5	1	1.5	0.5	1	1.5
25:75	43.0	41.3	42.7	53.8	11.0	43.7
50:50	32.6	34.0	32.6	33.5	32.5	26.1
75:25	16.0	13.9	18.2	19.8	41.0	12.3

**Table S5.** Degree of crystallinity of the samples after second heating [%].

PGItc:PLA ratio	OH/COOH ratio					
	Non-crosslinked nonwoven			Crosslinked nonwoven		
	0.5	1	1.5	0.5	1	1.5
25:75	36.7	30.6	38.0	41.0	12.0	36.6
50:50	27.5	26.5	27.6	29.4	24.3	24.1
75:25	15.8	14.3	13.4	10.4	34.0	8.8