

Supplementary Material

Effects of γ -ray irradiation on the molecular structure of collagen in different product forms

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1. Characterization of changes in collagen structure by circular dichroism

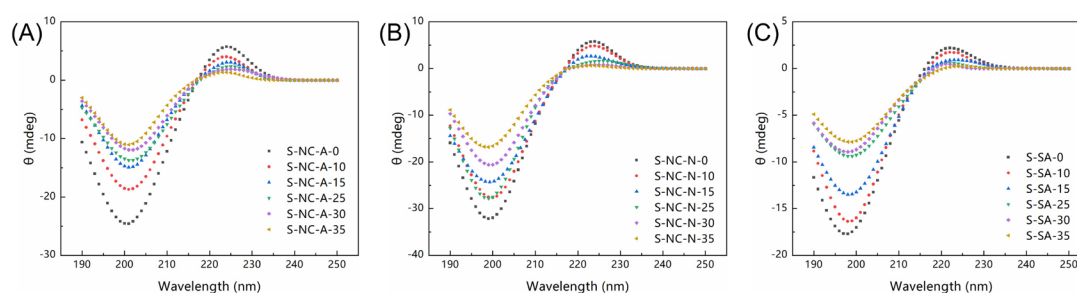


Figure S1. CD wavelength scanning curve of collagen sponge samples treated with different irradiation doses

2. Characterization of changes in collagen thermal stability by DSC

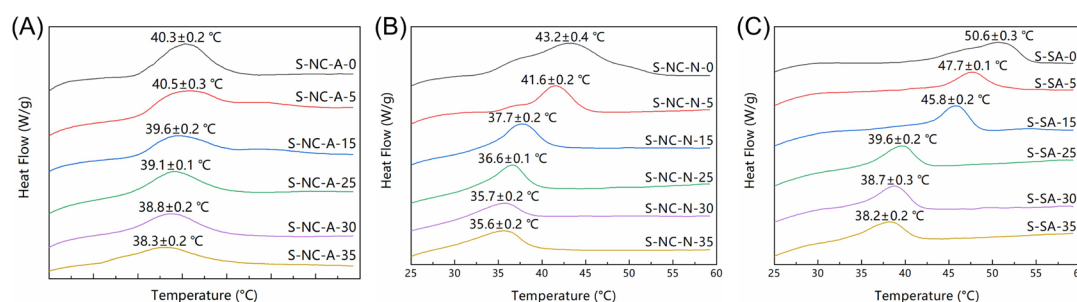


Figure S2. DSC signal curves of collagen sponge samples treated with different irradiation doses

3. FTIR analysis results of freeze-dried sponge of collagen PBS solution and collagen self-assembled gel treated with different doses of irradiation.

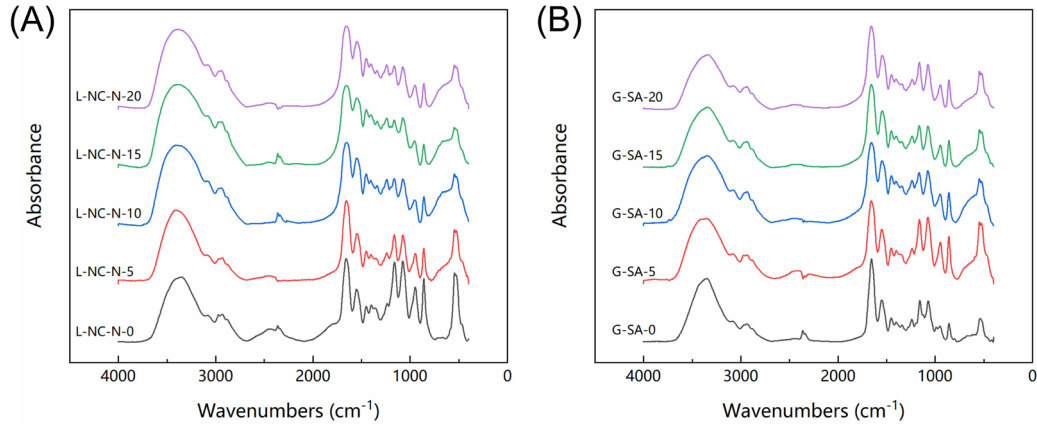


Figure S3. FTIR spectra of freeze-dried sponge of collagen PBS solution (A) and collagen self-assembled gel (B) treated with different doses of irradiation.

Table S1. Peak parameters obtained by deconvolution of the amide A and amide B bands in the FTIR spectra

Sample	Peak	Center	Area	Amplitude	Width	Sample	Peak	Center	Area	Amplitude	Width
L-NC-N-0	1	3527.2	43.67	0.249	164.6	G-SA-0	1	3524.5	24.47	0.149	154.6
	2	3395.5	119.27	0.487	230.1		2	3381.8	139.74	0.562	233.6
	3	3256.5	113.72	0.375	285.2		3	3242.9	86.60	0.251	323.9
	4	3068.1	8.17	0.106	72.3		4	3069.0	5.27	0.073	67.9
	5	2947.4	24.82	0.214	109.0		5	2940.8	14.96	0.135	103.7
	6	2865.1	6.35	0.089	67.1		6	2863.9	2.34	0.043	51.1
L-NC-N-5	1	3555.4	24.92	0.190	123.5	G-SA-5	1	3547.4	27.13	0.186	136.7
	2	3451.8	92.92	0.459	190.2		2	3445.4	72.90	0.348	197.0
	3	3299.6	188.61	0.617	287.0		3	3297.5	168.17	0.550	287.0
	4	3067.3	11.23	0.126	83.8		4	3068.8	10.42	0.125	78.5
	5	2945.0	22.60	0.191	111.2		5	2950.6	21.84	0.200	102.6
	6	2860.8	3.03	0.054	52.4		6	2868.4	5.94	0.082	68.0
L-NC-N-10	1	3564.4	42.16	0.298	132.9	G-SA-10	1	3540.8	47.58	0.257	174.1
	2	3457.0	111.53	0.519	201.7		2	3417.0	84.11	0.329	240.2
	3	3275.6	252.83	0.747	317.9		3	3277.6	188.96	0.546	325.3
	4	3065.0	14.05	0.168	78.8		4	3064.7	9.25	0.124	70.1
	5	2947.2	32.62	0.279	109.7		5	2943.5	28.76	0.245	110.1
	6	2865.4	5.56	0.089	58.7		6	2863.0	3.84	0.072	49.8
L-NC-N-15	1	3570.8	43.62	0.319	128.6	G-SA-15	1	3536.7	37.33	0.224	156.7
	2	3457.3	122.15	0.562	204.3		2	3411.2	87.48	0.368	223.3
	3	3266.9	257.80	0.751	322.4		3	3268.2	144.77	0.471	288.7
	4	3062.9	18.45	0.183	94.6		4	3065.8	9.54	0.123	72.8
	5	2945.3	35.73	0.324	103.5		5	2946.3	26.93	0.223	113.2

Sample	Peak	Center	Area	Amplitude	Width	Sample	Peak	Center	Area	Amplitude	Width
	6	2867.3	7.57	0.119	60.0		6	2863.3	3.03	0.058	48.7
L-NC-N-20	1	3562.6	40.97	0.291	132.4	G-SA-20	1	3537.8	29.24	0.188	146.0
	2	3452.8	110.78	0.519	200.4		2	3413.8	77.23	0.337	215.2
	3	3274.1	239.97	0.725	310.9		3	3272.8	130.78	0.435	282.4
	4	3064.1	15.33	0.176	82.0		4	3063.8	9.74	0.118	77.4
	5	2946.9	33.61	0.289	109.3		5	2947.2	22.30	0.195	107.6
	6	2864.4	4.79	0.084	53.7		6	2863.2	3.41	0.058	55.0

Table S2. Peak parameters obtained by deconvolution of the amide I and amide II bands in the FTIR spectra

Sample	Peak	Center	Area	Amplitude	Width	Sample	Peak	Center	Area	Amplitude	Width
L-NC-N-0	1	1667.2	43.77	0.668	61.6	G-SA-0	1	1658.7	53.57	0.736	68.4
	2	1633.5	16.09	0.330	45.8		2	1645.9	9.83	0.190	48.6
	3	1550.7	24.60	0.407	56.8		3	1550.7	22.59	0.388	54.7
	4	1517.6	1.90	0.069	25.8		4	1516.8	1.71	0.065	24.7
L-NC-N-5	1	1656.9	69.88	0.825	79.5	G-SA-5	1	1658.2	64.79	0.786	77.5
	2	1631.3	1.67	0.064	24.4		2	1629.8	1.96	0.079	23.5
	3	1550.3	21.33	0.397	50.4		3	1551.7	22.10	0.423	49.1
	4	1519.5	4.23	0.129	30.8		4	1520.1	4.31	0.132	30.7
L-NC-N-10	1	1664.4	72.21	0.736	92.2	G-SA-10	1	1661.0	68.37	0.728	88.3
	2	1623.5	7.02	0.167	39.5		2	1627.3	2.89	0.089	30.4
	3	1552.7	27.62	0.461	56.2		3	1550.0	24.43	0.426	53.9
	4	1518.7	5.46	0.166	30.8		4	1516.9	4.63	0.146	29.8
L-NC-N-15	1	1672.0	63.48	0.663	90.0	G-SA-15	1	1660.1	74.87	0.825	85.3
	2	1623.6	12.02	0.231	48.8		2	1630.7	2.29	0.080	26.9
	3	1555.6	26.44	0.398	62.5		3	1549.4	24.27	0.450	50.7
	4	1518.4	5.52	0.157	33.0		4	1517.2	5.50	0.169	30.5
L-NC-N-20	1	1667.6	66.12	0.720	86.3	G-SA-20	1	1660.6	72.71	0.806	84.8
	2	1623.8	10.64	0.227	44.0		2	1633.3	2.37	0.076	29.2
	3	1554.2	29.07	0.452	60.4		3	1549.2	21.38	0.406	49.5
	4	1519.1	5.76	0.167	32.4		4	1517.6	5.98	0.174	32.2

4. Texture analysis results of freeze-dried sponge of collagen PBS solution and collagen self-assembled gel treated with different doses of irradiation.

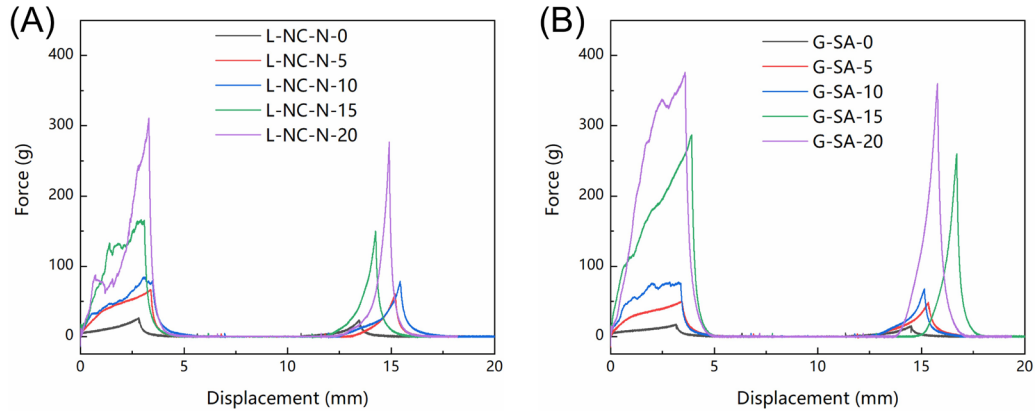


Figure S4. Texture analysis of the lyophilized sponge part samples of collagen PBS solution (A) and collagen self-assembly gel (B) irradiated with different doses

Table S3. Texture parameters of collagen PBS solution (A) and collagen self-assembly gel (B) lyophilized product sponge samples treated with different doses of irradiation ($n = 3$, $\bar{x} \pm s$).

Sample		Different doses/kGy				
		0	5	10	15	20
L-NC-N	Hardness	19.25±1.57 ^c	64.26±4.92 ^{bc}	87.71±5.55 ^{bc}	121.27±24.57 ^b	247.72±42.7 ^a
	Elasticity	0.81±0.02 ^a	0.63±0.02 ^b	0.78±0.03 ^a	0.77±0.02 ^a	0.76±0.02 ^a
	Resilience	0.19±0.01 ^a	0.11±0.01 ^b	0.14±0.01 ^b	0.13±0.01 ^{ab}	0.12±0.01 ^b
G-SA	Hardness	23.87±1.79 ^c	42.10±4.97 ^c	60.03±9.79 ^c	225.37±31.78 ^b	326.57±26.93 ^b
	Elasticity	0.80±0.02 ^a	0.78±0.02 ^a	0.77±0.01 ^a	0.58±0.04 ^a	0.57±0.02 ^b
	Resilience	0.17±0.03 ^a	0.15±0.01 ^a	0.11±0.01 ^b	0.10±0.01 ^b	0.10±0.01 ^b

Note: The above significance analysis compares the compression indexes of L-NC-A and G-SA separately; a, b, and c indicate a significant difference between the two groups of sponge tensile indexes under different pressures, $\alpha = 0.05$; n represents three parallel experiments; \bar{x} represents the mean; s represents the standard deviation.