

Eco-Friendly Depolymerization of Alginates by H₂O₂ and High-Frequency Ultrasonication

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Table S1. The molecular weight and polydispersity of the products based on oxidation reaction temperature and the use of oxidants

Reaction temperature (°C)	Molecular weight, Mw (Da)		Polydispersity (Dp)	
	H ₂ O ₂	H ₂ O ₂ +Fe ₃ O ₄	H ₂ O ₂	H ₂ O ₂ +Fe ₃ O ₄
Alginate	906,000	-	4.8	-
70	4,230	2,730	1.52	1.39
90	2,380	1,640	1.36	1.44
110	840	940	1.58	1.62
130	790	860	1.48	1.46

Table S2. Peak assignments for carboxylic anions, aliphatic C-H, glycosidic linkage, pyranose ring, and uronic acid group

Wavelength(cm ⁻¹)	Assignment
1408 and 1594	Carboxyl anions
831 and 1448	Aliphatic C-H
1170	Glycosidic linkage
1045, 1080 and 1125	Pyranose ring
950	Uronic acid group

Table S3. The molecular weight for each raw material and products of ultrasonication

Reaction time (h)	Molecular weight, Mw (Da)							
	70	90	110	130	F70	F90	F110	F130
0	4,230	2,380	840	790	2,730	1,640	940	860
3	3,960	2,390	930	850	2,530	1,670	1,060	970
6	3,410	2,370	920	850	2,420	1,660	1,060	970
10	3,380	2,310	940	850	2,210	1,690	1,040	980

Table S4. The polydispersity for each raw material and products of ultrasonication

Reaction time (h)	Polydispersity (PD)							
	70	90	110	130	F70	F90	F110	F130
0	1.52	1.36	1.58	1.48	1.39	1.44	1.62	1.46
3	1.50	1.32	1.24	1.24	1.36	1.43	1.31	1.24
6	1.47	1.33	1.24	1.23	1.34	1.44	1.33	1.28
10	1.47	1.31	1.25	1.19	1.26	1.42	1.31	1.26

Figure S1. GPC spectra for raw alginate material and products after oxidative decomposition with (a) H_2O_2 (70–130) and (b) $\text{H}_2\text{O}_2+\text{Fe}_3\text{O}_4$ (F70–F130).