

Electronic Supplementary Information for

**Deconstructing poplar lignin from ionic liquid pretreatment for
biological conversion through sulfonation and Fenton chemistry**

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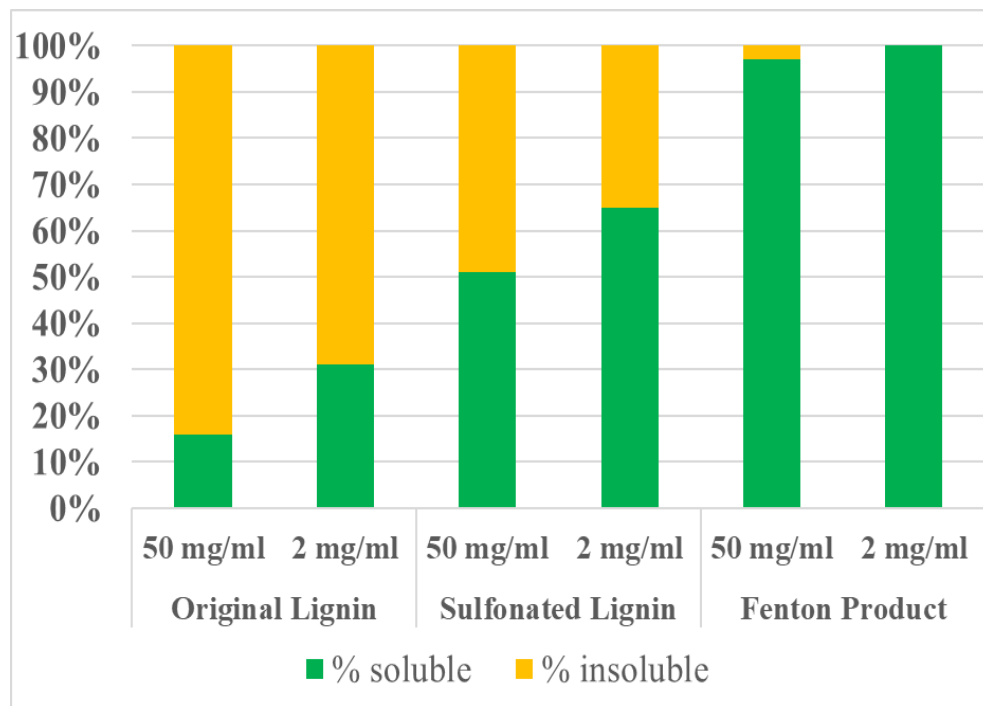


Figure S1. Plot of soluble fraction for original poplar lignin, after sulfonation, and after Fenton reaction with dialyzed LS (case III).

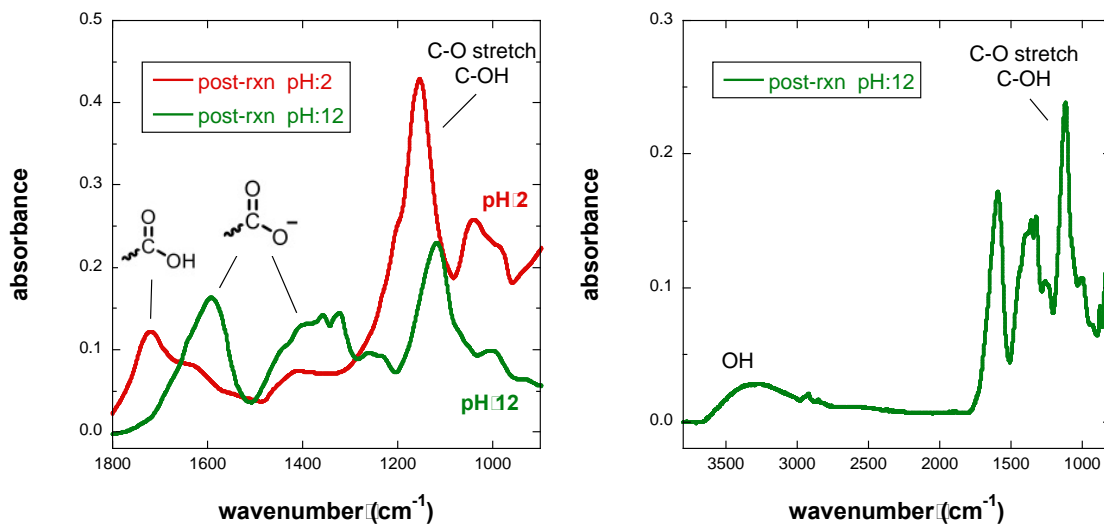


Figure S2. a) FTIR spectra in the fingerprint region for the Fenton reaction products from case III dried from solutions at pH 2 and pH 12. The shift in the carbonyl band from 1591 cm^{-1} at pH 12 to 1720 cm^{-1} at pH 2 indicates the presence of carboxylic acids. b) Full FTIR spectrum for the sample prepared from solution at pH 12 providing evidence for secondary and tertiary hydroxyl groups.

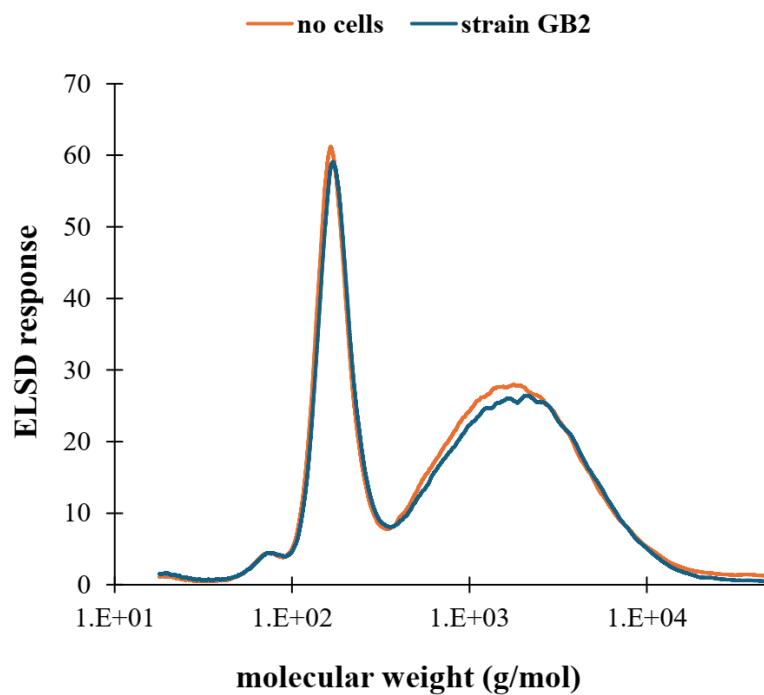


Figure S3. Molecular weight distributions before and after incubations with bisabolene-producing strain GB2.

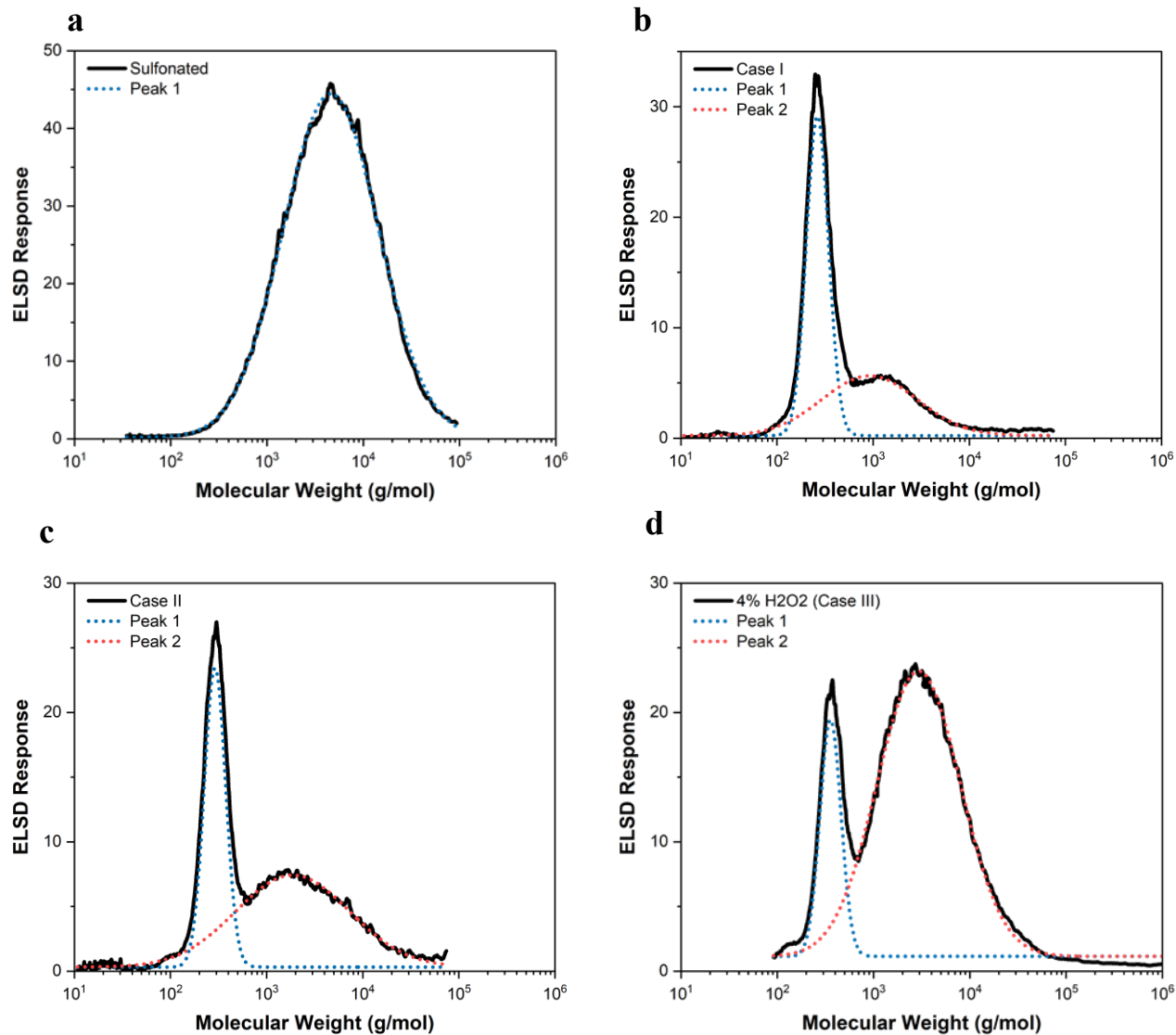


Figure S4. Fitted size exclusion chromatograms. a) Sulfonated lignin b) Case I, 0 mM Fe loading, c) Case II, 40 mM Fe loading, d) Case III, 100 mM Fe loading. Chromatograms were fitted with multiple Gaussian peaks to determine Mn, Mw, and PDI.

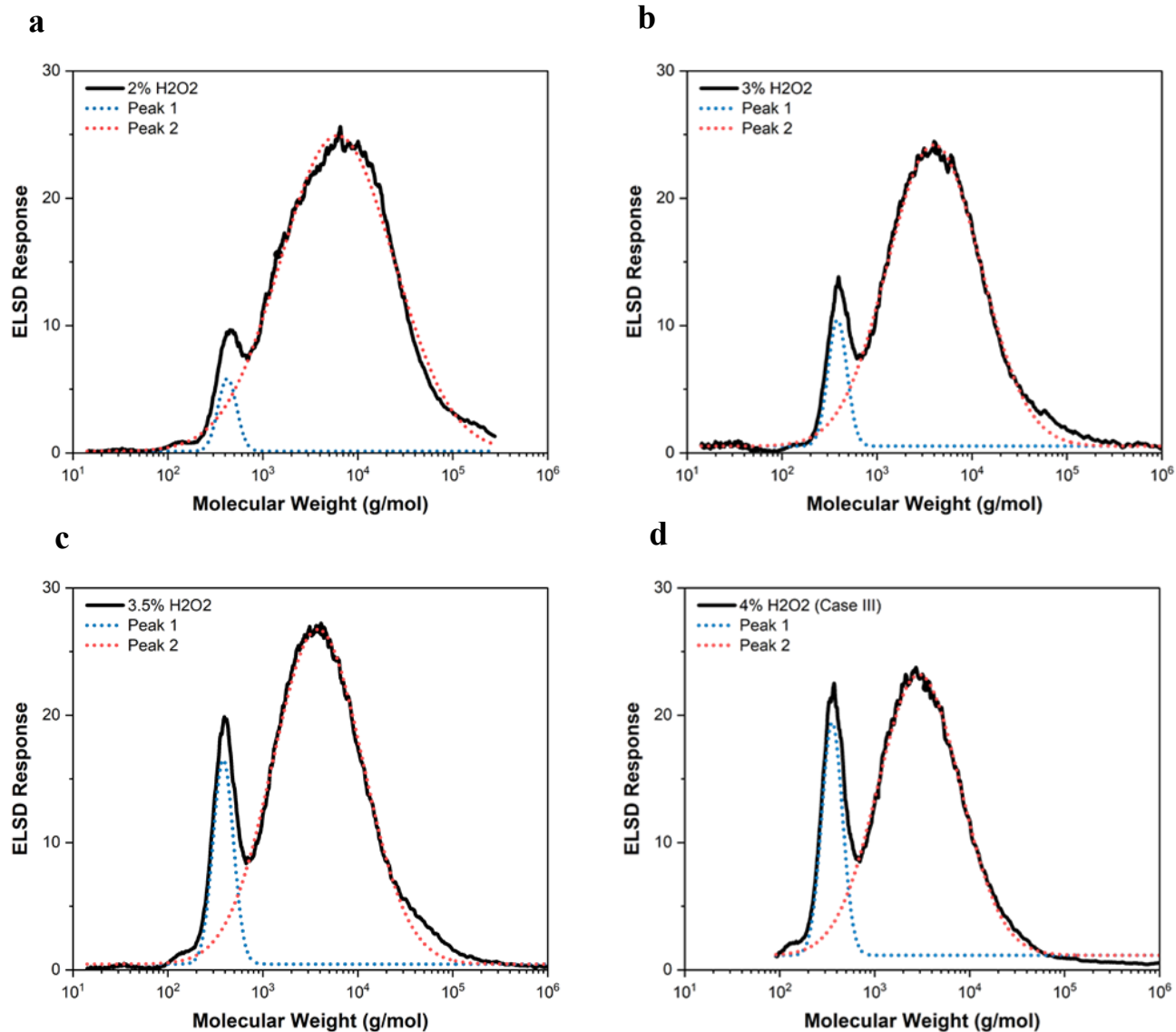


Figure S5. Fitted size exclusion chromatograms. a) 2% H₂O₂ concentration, b) 3% H₂O₂ concentration, c) 3.5% H₂O₂ concentration, d) 4% H₂O₂ concentration. Chromatograms were fitted with multiple Gaussian peaks to determine Mn, Mw, and PDI.

Table S1. Molecular weight distribution values of the soluble portions of sulfonated lignin after Fenton reaction for three Cases with varied Fe.

		Sulfonated	Case I	Case II	Case III
Peak 1	Mn (g/mol)	7428	271	300	376
	Mw (g/mol)	19753	286	317	398
	PDI	2.65	1.05	1.06	1.05
Peak 2	Mn (g/mol)	--	1475	3734	4338
	Mw (g/mol)	--	5396	15925	11282
	PDI	--	3.66	4.27	2.60

Table S2. Molecular weight distribution values of the soluble portions of sulfonated lignin after Fenton reaction for with varied H₂O₂ concentration.

		Sulfonated	2%	3%	3.5%	4%
Peak 1	Mn (g/mol)	7428	452	406	405	376
	Mw (g/mol)	19753	470	424	427	398
	PDI	2.65	1.03	10.4	1.05	1.05
Peak 2	Mn (g/mol)	--	12810	6990	6345	4338
	Mw (g/mol)	--	45891	25984	22101	11282
	PDI	--	3.58	3.71	3.48	2.6