Supplemental Materials

A fast and low energy-consumption method for the conversion of lignocellulosic biomass to sustainable structural color materials

Chengfen Zhou, Weiyi Zhao, Jingyu Wang*, Xuemei Wei, Jiawen Lai, Changwei Hu*

Key Laboratory of Green Chemistry and Technology, Ministry of Education; National and Local Joint Engineering Laboratory of Energy Plant Biofuel Preparation and Utilization; College of Chemistry, Sichuan University, Chengdu 610064, China

* Corresponding authors

Jingyu Wang (jingyuwang74@163.com); Changwei Hu (changweihu@scu.edu.cn)

Table S1. The contents of different components in extracting solution.

Pretreatment solvent		Component content (mg/L)						
		Lignin	Glucose	Xylose	Fructose	Arabinose	Formic acid	Acetic acid
Acetone -water	9:1	1947	50	93	101	55	232	1268
	8:2	3215	92	119	133	97	209	1423
	7:3	2521	115	105	120	108	152	1115
	6:4	2757	163	109	155	138	137	1001
Tetrahydrofuran -water	9:1	2243	49	76	111	91	290	1498
	8:2	2870	100	102	165	150	297	1770
	7:3	4828	160	112	169	162	217	1682
	6:4	3778	160	111	160	148	138	1202
Ethanol -water	9:1	1249	81	59	100	46	118	749
	8:2	1794	114	76	121	98	120	920
	7:3	1678	117	69	106	114	98	776
	6:4	2731	128	76	112	131	85	647

Table S2. The extraction rate of cellulose, hemicellulose, and lignin from bamboo after pretreatments.

Pretreatment solvent		Extraction rate (wt%)			
		Total	Cellulose	Hemicellulose	Lignin
Acetone -water	9:1	12.2	0.5	0.4	15.0
	8:2	9.8	0.7	1.1	24.8
	7:3	10.9	0.4	1.6	19.4
	6:4	6.4	0.8	7.5	21.2
Tetrahydrofuran -water	9:1	16.4	0.5	0.5	17.3
	8:2	20.8	0.3	1.2	22.1
	7:3	10.5	1.9	12.4	37.2
	6:4	7.2	1.1	15.2	29.1
Ethanol -water	9:1	11.3	0.3	0.3	9.6
	8:2	6.2	0.5	0.7	13.8
	7:3	6.4	0.5	1.3	12.9
	6:4	4.5	0.8	7.0	21.0

Table S3. The mass ratio of lignin, monosaccharide, small molecule acid, and other components in extracting solutions.

Pretreatment solvent		Mass ratio (%)			
		Lignin	Monosaccharide	Small molecule acid	Others
Acetone -water	9:1	47.9	7.4	36.9	7.8
	8:2	53.5	7.3	27.2	12.0
	7:3	48.7	8.6	24.5	18.2
	6:4	45.8	9.4	18.9	25.8
Tetrahydrofuran -water	9:1	48.2	7.0	38.4	6.3
	8:2	45.9	8.3	33.0	12.8
	7:3	47.2	5.9	18.6	28.4
	6:4	47.9	7.3	17.0	27.8
Ethanol -water	9:1	46.6	10.7	32.4	10.3
	8:2	50.0	11.4	29.0	9.7
	7:3	50.2	12.1	26.1	11.6
	6:4	52.2	8.5	14.0	25.3

Table S4. The zeta potential of lignin clusters obtained in different acetone-water cosolvents.

Pretreatment solvent		zeta potential (mv)
Acetone -water	9:1	-21.0
	8:2	-20.6
	7:3	-18.0
	6:4	-15.7

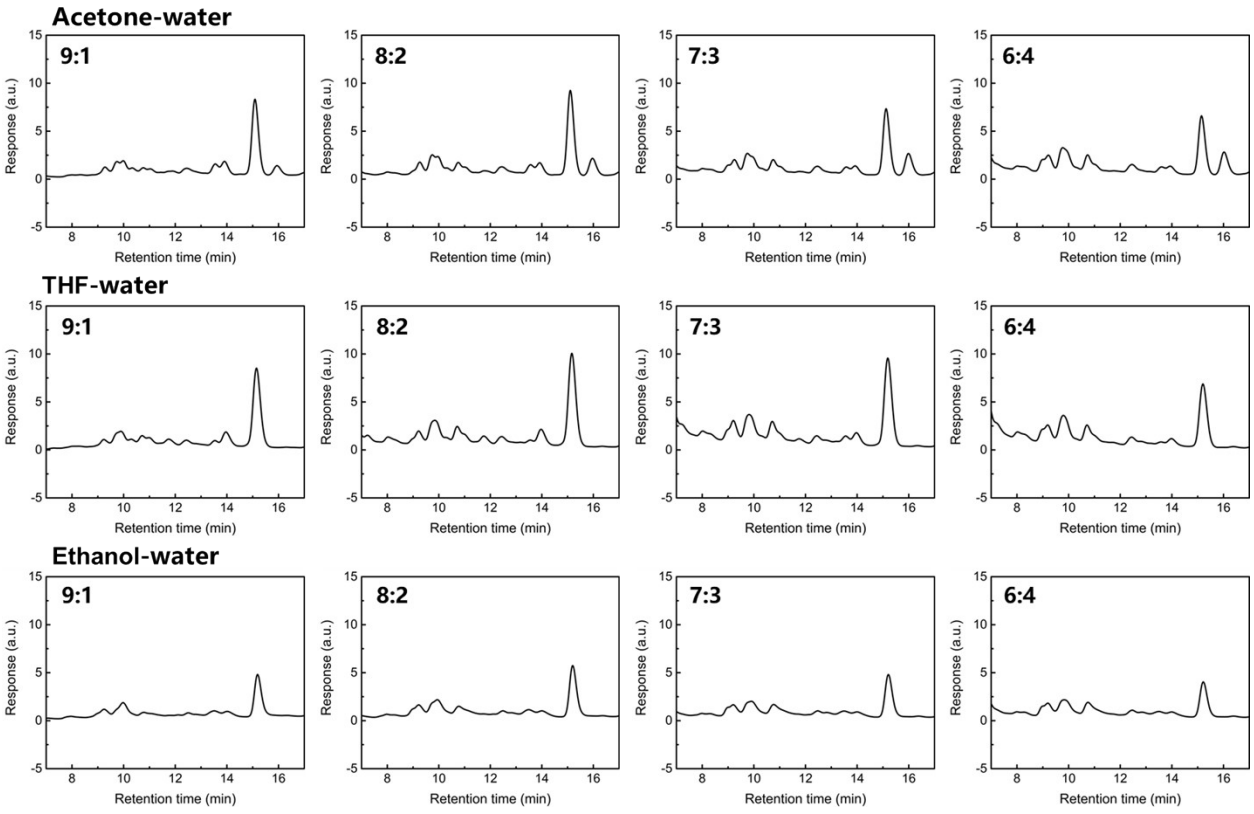

Figure S1. HPLC chromatograms of bamboo extracting solution in different organic solvent-water cosolvents. The retention time of different components: glucose (9.2 min), xylose (9.7 min), fructose (9.9 min), arabinose (10.7 min), formic acid (13.9 min), and acetic acid (15.2 min).

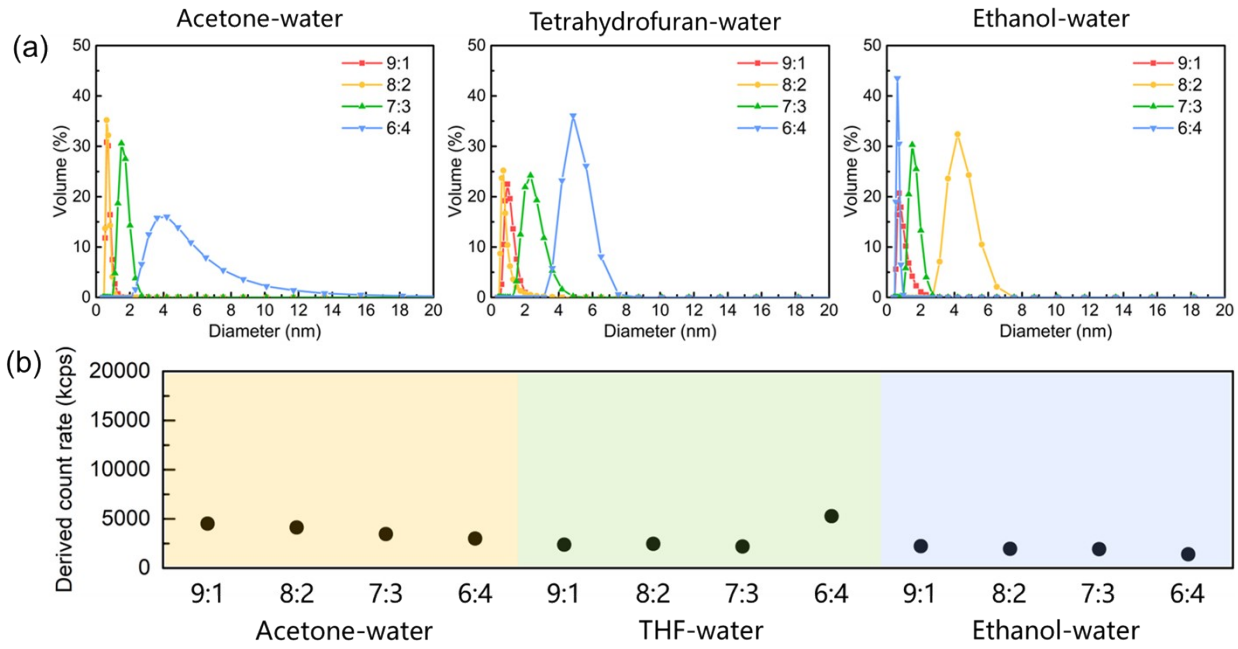

Figure S2. (a) The diameter measurement and (b) scattering light intensity signal of extracted solution. All ratios of organic and water listed in the figure are volume ratios. The compounds in extracted solution exhibit average diameters predominantly below 5 nm, with light scattering intensities consistently under 5000 kcps, indicating the absence of significant aggregation.

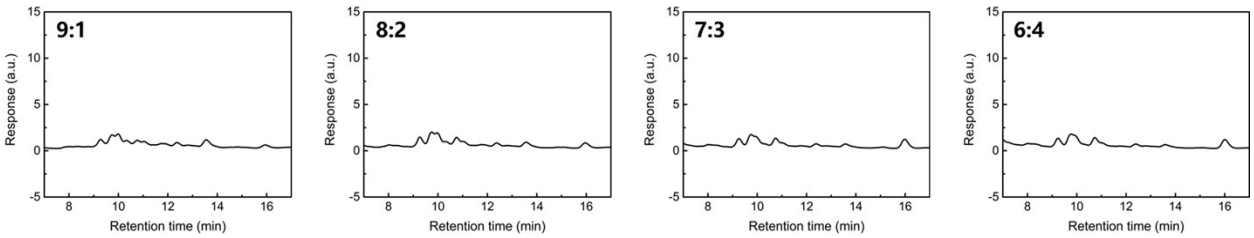

Figure S3. HPLC chromatograms of the redissolved precipitates. The precipitates obtained after the self-assembly and centrifugation of extracting solution in acetone-water cosolvent.

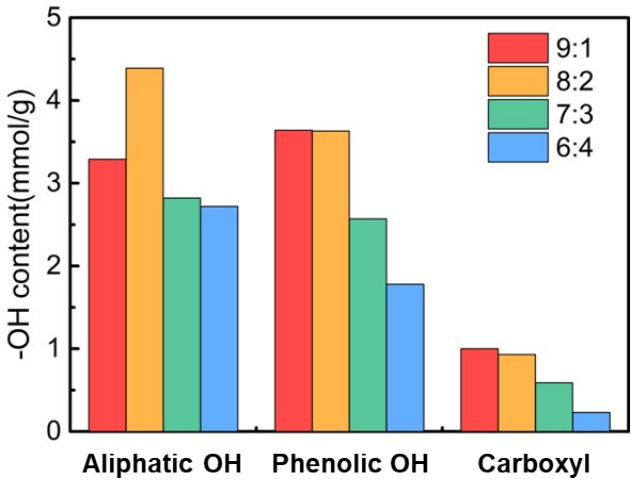

Figure S4. The polar functional group contents of lignin extracted from bamboo in different acetone-water cosolvents.

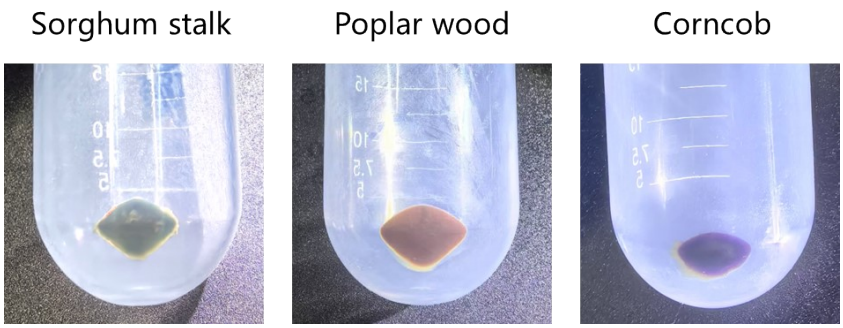

Figure S5. The structural colors made from sorghum stalk, poplar wood, and corncob.