

Supplement Table 1. FTIR band assignments of cellulose and its derivative during the pyrolysis process

No.	Wavenumber/cm ⁻¹	Functional group
1	3420	O-H stretching vibration
2	3046	aromatic C-H stretching vibration
3	2900-2921	aliphatic C-H stretching vibration
4	2869	aliphatic C-H stretching vibration
5	1705	carbonyl stretching vibration of carboxylic groups, aldehydes, ketones
6	1641	O-H bending
7	1600	C=O stretching vibration, aromatic C=C vibration
8	1432	CH ₂ at C-6 bending (sym)
9	1428	aromatic skeletal vibration combined with C-H in plane deformation or asymmetric C-O stretch of C-O stretching vibration from carbonates
10	1421/1433	Aromatic C=C ring structure
11	1373	C-H bending
12	1373	Aliphatic CH ₃ deformation
13	1337	C-OH in plane at C-2 or C-3 bending
14	1319	CH ₂ (wagging) at C-6 bending
15	1282	C-H bending
16	1236	C-OH in plane at C-6 bending
17	1236/1223/1171	Aromatic C=O stretching
18	1165	C-O-C β-glucosidic linkage stretching
19	1113	ring in plane stretching
20	1113	Aromatic C=O stretching
21	1058	C=O at C-3 stretching; C-C stretching
22	1054	Aromatic C=O stretching
23	1031	C=O at C-6 stretching
24	896	C-O-C at β-glycosidic linkage stretching; C-O-C, C-C=O, and C-C-H at C-5 and C-6 stretching
25	879	aromatic C-H out of plane deformation C-O out of plane deformation from carbonates 1 adjacent H deformation
26	810	2 adjacent H deformations