Supporting Information for

Low-Temperature Torrefaction of *Phyllostachys heterocycla cv. pubescens*: Effect of Two Torrefaction Procedures on the Composition of Bio-Oil Obtained

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Number of pages: 6

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Number of tables: 2

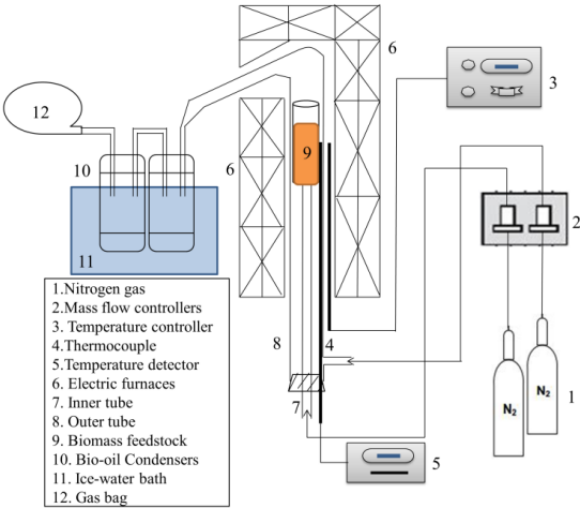

Figure S1. The schematic diagram of torrefaction process.

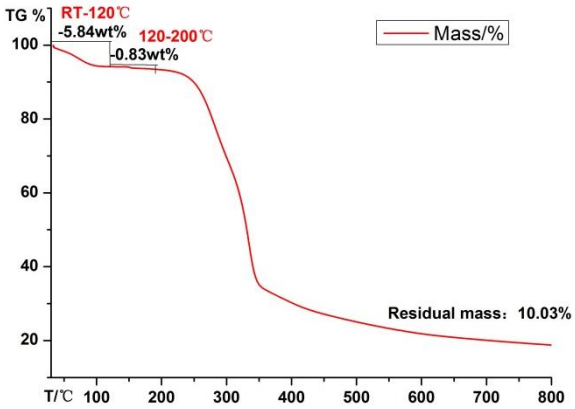

Figure S2. Thermogravimetric (TG) curve of *pubescens.*

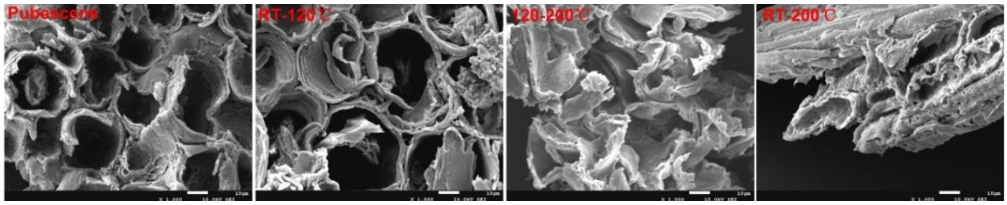

Figure S3. SEM micrographs of raw material and solid residues. Reaction conditions: Two-step torrefaction and one-step torrefaction of *pubescens* at 200 °C for 2 h.

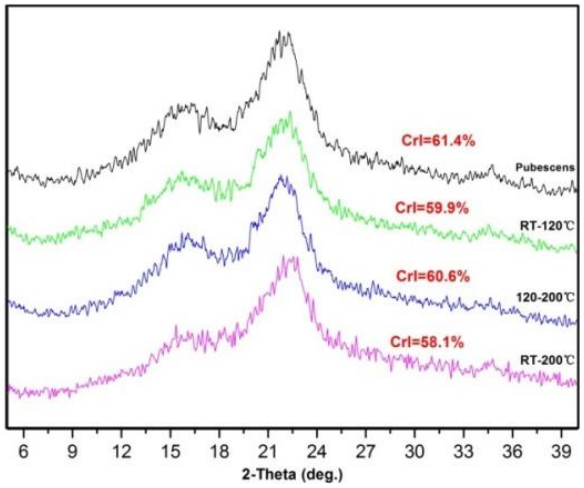

Figure S4. XRD of raw material and reaction residues.

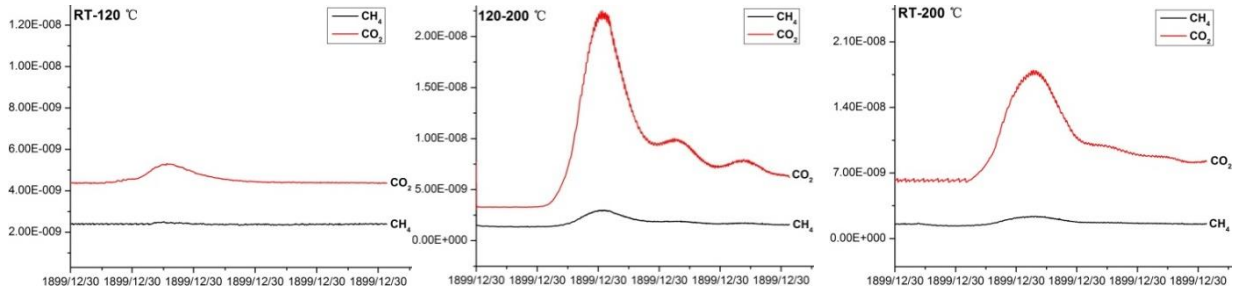

Figure S5. The online mass spectrometry of the off-gas from torrefaction.

Table S1. Weight-average (Mw) and number-average (Mn) molecular weights and polydispersity (Mw/ Mn) of the oligomers

T/°C	RT-120°C	120-200°C		RT-200°C	
	a	a	b	a	b
Mw	428	646	271	662	267
Mn	367	528	265	535	261
Polydispersity	1.67	1.22	1.02	1.24	1.02

Table S2. Assignment of main lignin ^{13}C-^{1}H correlation signals in HSQC spectra of liquid fraction according to literature

Labels	δ_C/δ_H (ppm)	Assignment
OMe	56.0/3.74	C-H in methoyls
C_γ	62.6/3.71	C_γ-H_γ in phenylcoumaran substructure (C)
C_γ	67.02/4.12	γ-ethers
P_{OH}	71.66/3.18	Pyranose OH
C_β	83.34/4.31	C_β- H_β in β-O-4
G_2	111.5/6.80	C_2-H_2 in guaiacyl units (G)
G_5, $H_{3,5}$	115.3/6.68-6.99	C_5-H_5 in guaiacyl units (G) or
		$C_{3,5}$-$H_{3,5}$ in p-hydroxyphenyl units (H)
$S_{2,6}$	104.3/6.71	$C_{2,6}$-$H_{2,6}$ in syringyl units (S)
$S'_{2,6}$	106.5/7.26	$C_{2,6}$-$H_{2,6}$ in (C_α=O) syringyl units (S)
4-O-5	109.5/6.61	4-O-5 unit
F_2	110.7/7.26	C_2-H_2 in esterified ferulates or free ferulic acids
F_β	114.8/6.41	C_β-H_β in ferulates
$H_{2,6}$	128.2/7.19	$C_{2,6}$-$H_{2,6}$ in p-hydroxyphenyl units (H)
$H'_{2,6}$	130.8/7.56	$C_{2,6}$-$H_{2,6}$ in oxidized (C_α=O) p-hydroxyphenyl units (H)

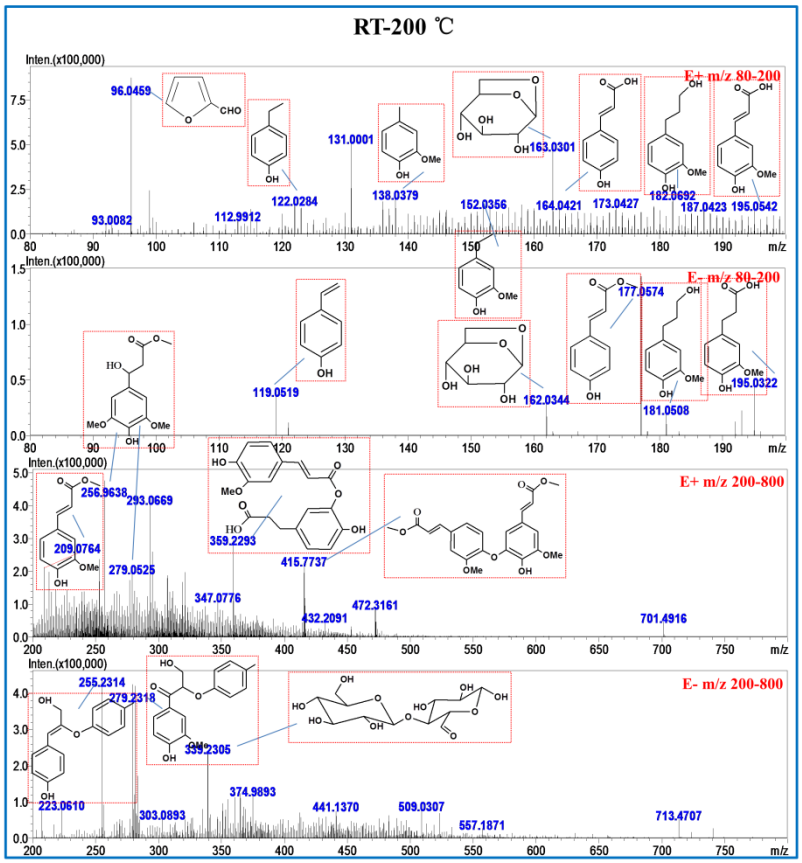

Figure S6. ESI-MS spectra of liquid products obtained from one-step torrefaction at RT-200 °C.

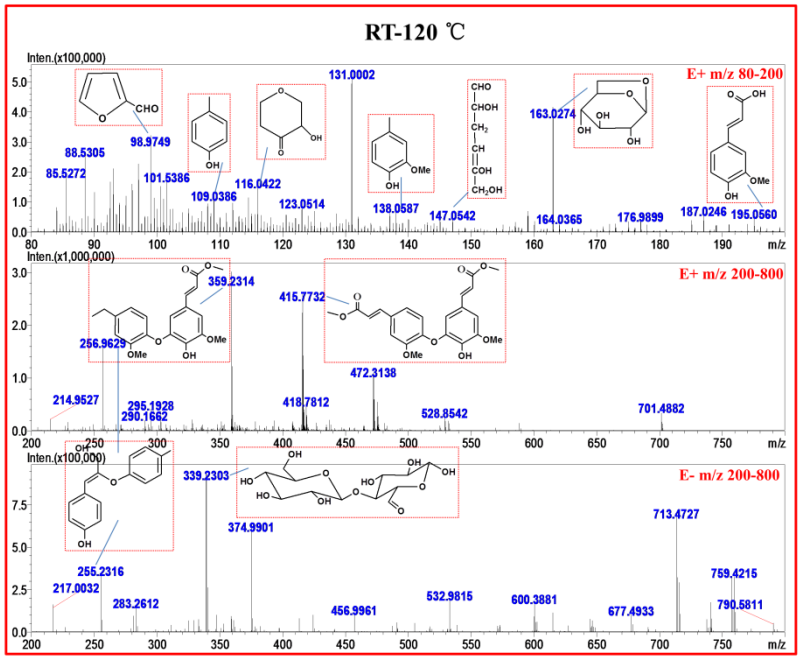

Figure S7. ESI-MS spectra of liquid products obtained from the first torrefaction step at RT-120 °C.

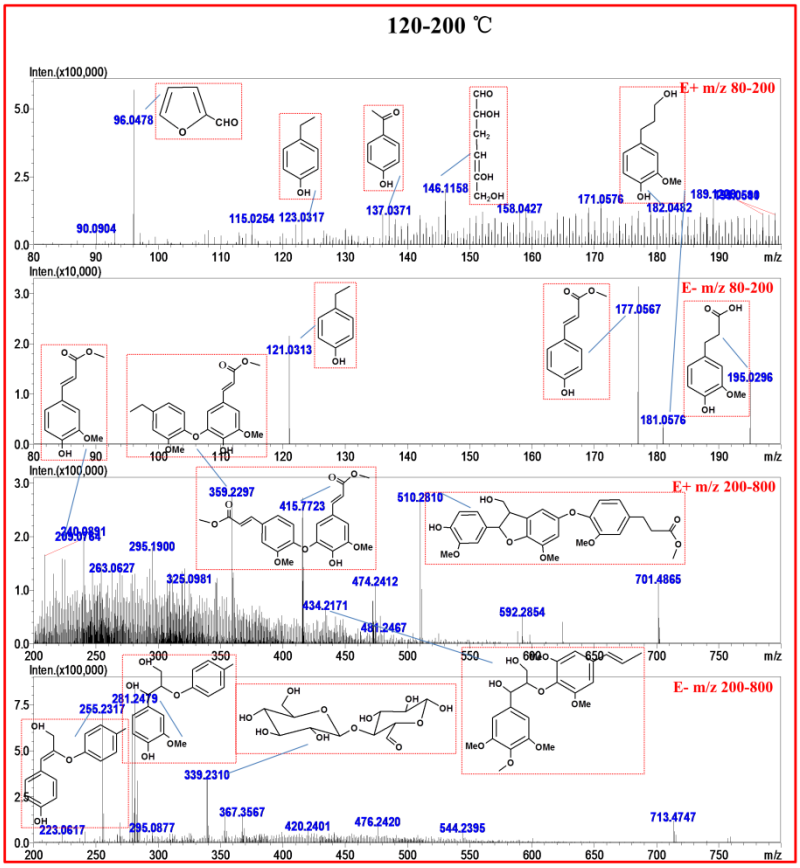

Figure S8. ESI-MS spectra of liquid products obtained from the second torrefaction step at 120-200 °C.