Supplementary Data

Supplementary Table S1. Char nitrogen content before and after exposure to NH_3.

Char	mg NH_3 generated[a]	Initial N content (mg g^{-1})	N content after sorption (mg g^{-1})
Untreated chars			
OAK (a.r.)	43	1.4 ± 0.2	12.5 ± 0.4
OAK 250 °C	43	4.3 ± 0.2	19.7 ± 1.6
OAK 250 °C	450	4.3 ± 0.2	27.8 ± 0.1
OAK 250 °C	1000	4.3 ± 0.2	36.3 ± 0.1
OAK 250 °C	1500	4.3 ± 0.2	40.8 ± 3.1
OAK 450 °C	43	5.3 ± 0.9	7.7 ± 1.1
OAK 650 °C	43	5.5 ± 1.0	6.1 ± 0.1
Acid-treated chars			
OAK 250-H_3PO_4	43	3.4 ± 0.3	17.99 ± 0.02
OAK 450-H_3PO_4	43	4.3 ± 0.7	11.5 ± 0.3
OAK 650-H_3PO_4	43	5.2 ± 0.6	8.4 ± 1.9
OAK 250-H_2SO_4	43	3.9 ± 0.3	16.7 ± 0.5
OAK 450-H_2SO_4	43	5.4 ± 0.8	12.2 ± 0.7
OAK 650-H_2SO_4	43	5.9 ± 0.1	7.3[b]
OAK 250-H_2O_2	43	3.3 ± 0.3	23.7 ± 1.4
OAK 450-H_2O_2	43	4.6 ± 0.8	12.9 ± 1.0
OAK 650-H_2O_2	43	4.9 ± 0.5	4.8 ± 0.8
KOH-treated chars			
OAK 250-KOH	43	3.7 ± 0.6	24.2 ± 0.7
OAK 450-KOH	43	6.3 ± 1.0	11.0 ± 0.3
OAK 650-KOH	43	7.0 ± 0.3	7.8 ± 0.6

[a]N contents reported as average of duplicate analysis ± standard deviation, based on mg NH_3 generated according to Equation (2); [b]single analysis only due to limited sample availability; OAK (a.r.) refers to unprocessed oak biomass.

Supplementary Table S2. ATR-FTIR functional group assignment of prominent bands.

Band (nm)	**Assignment**
800	H deformation or C–H bending of aromatic groups
1000,1100	O–H from aliphatic group vibrations
1204	Phenolic O–H deformations and C-O stretching
1330-1271	Aromatic C=C or C–O stretching
1456-1403	C=O stretching of phenols or ketones; asymmetric COO^- stretching; O-H deformation.
1507	C=C stretching of lignin
1603	Conjugated ketone and quinone C=O stretching vibrations or aromatic C=C
1703, 1700	C=O stretching of carbonyl bonds
2985-2821	Aliphatic stretching vibrations of $–CH_x$

References: Tan et al. (2015); Yuan et al. (2011).

Supplementary Table S3. ANOVA analysis for Figure 3.

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	568.998124	3	189.666	60.57221	0.000864	6.591382
Within Groups	12.5249546	4	3.131239			
Total	581.523078	7				

Supplementary Table S4. ANOVA analysis for Figure 4a.

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	94.23441369	4	23.5586	21.43506	0.002396	5.192167773
Within Groups	5.495342225	5	1.099068			
Total	99.72975592	9				

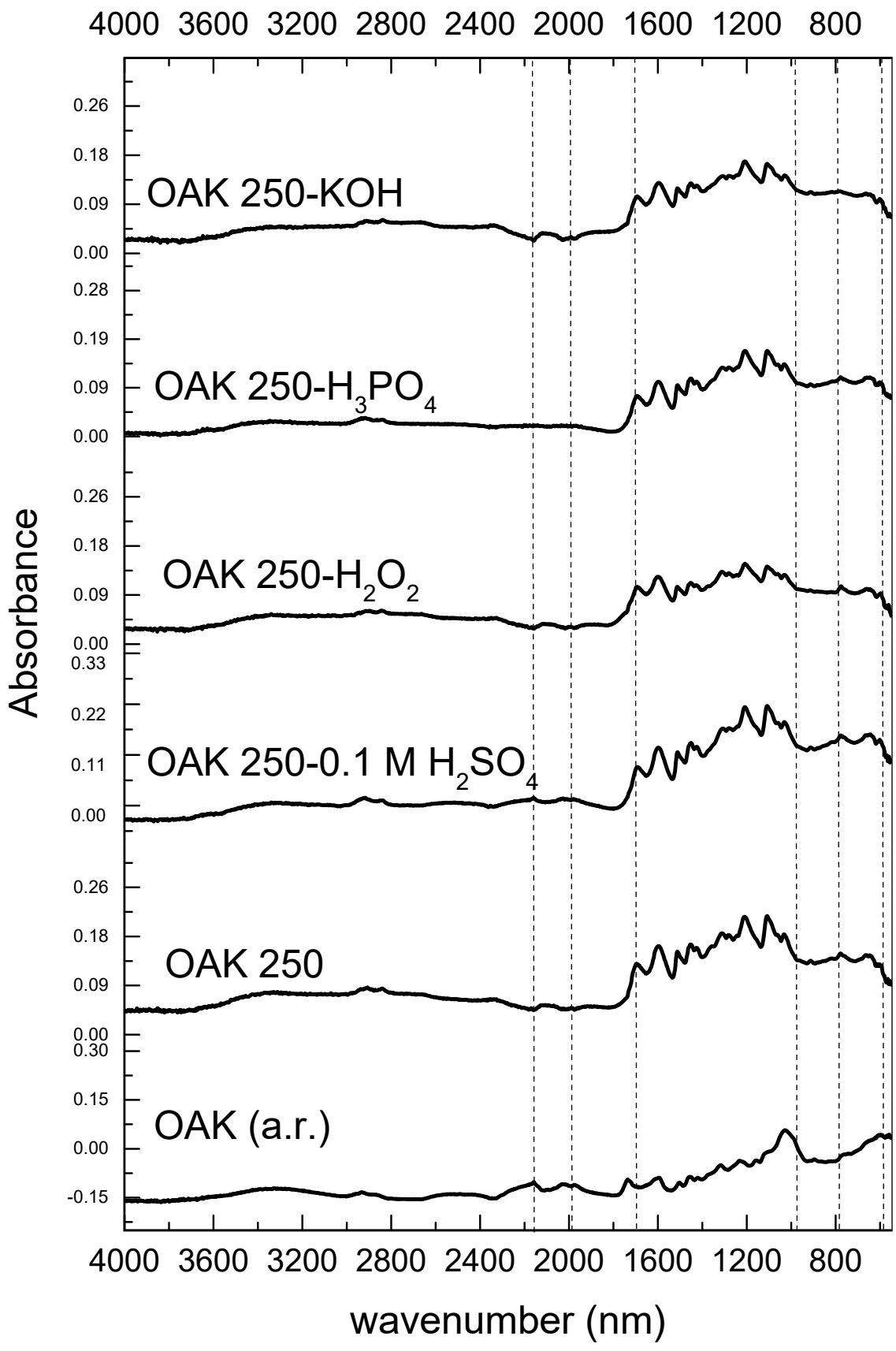
Supplementary Table S5. ANOVA analysis for Figure 4b.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	71.9078455	4	17.97696	12.10208	0.008758	5.192168
Within Groups	7.42722146	5	1.485444			
Total	79.335067	9				

Supplementary Table S6. ANOVA analysis for Figure 4c.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	16.45104	4	4.11276	1.879503	0.252218	5.192168
Within Groups	10.94108	5	2.188216			
Total	27.39212	9				

(a)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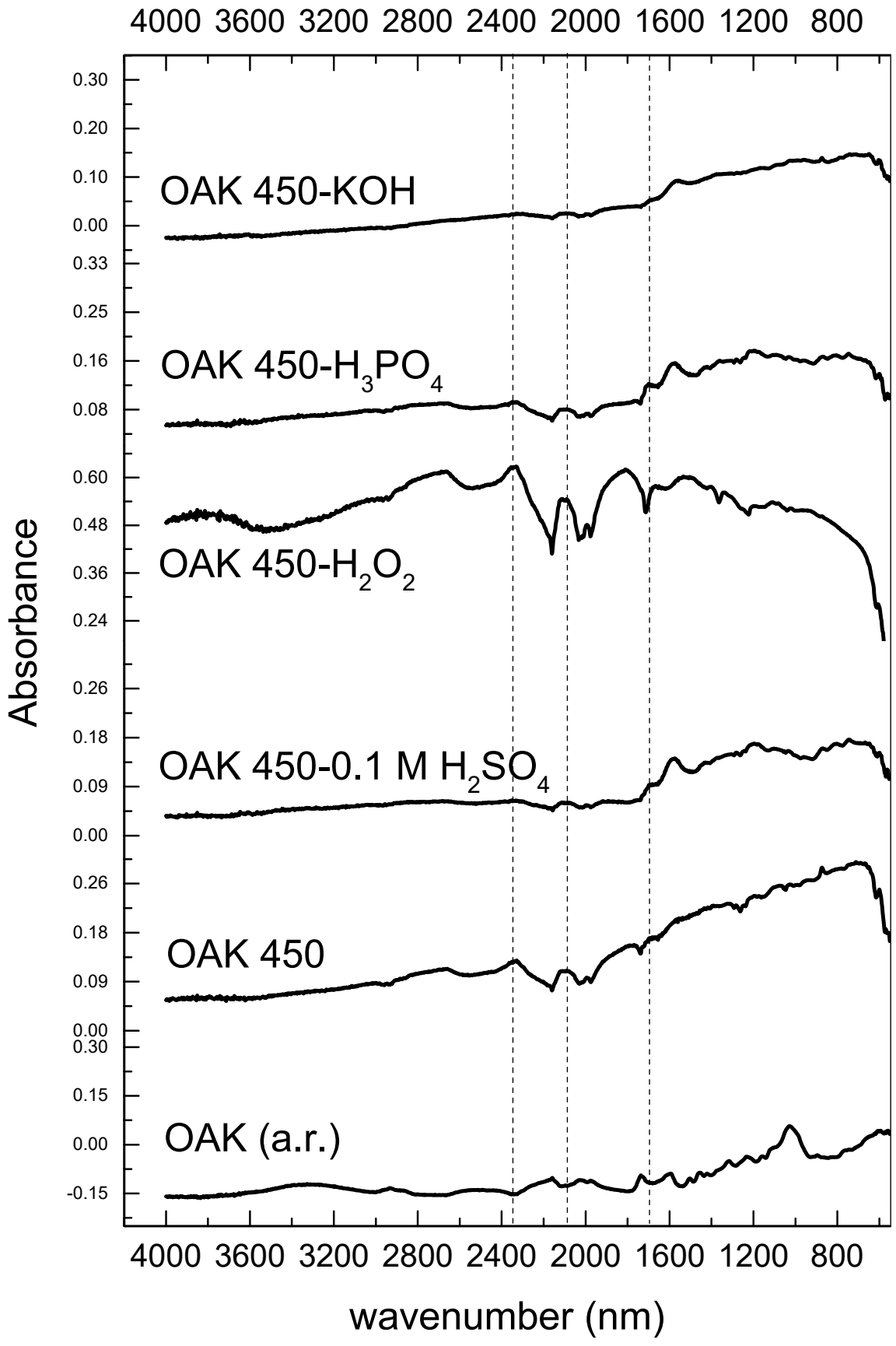
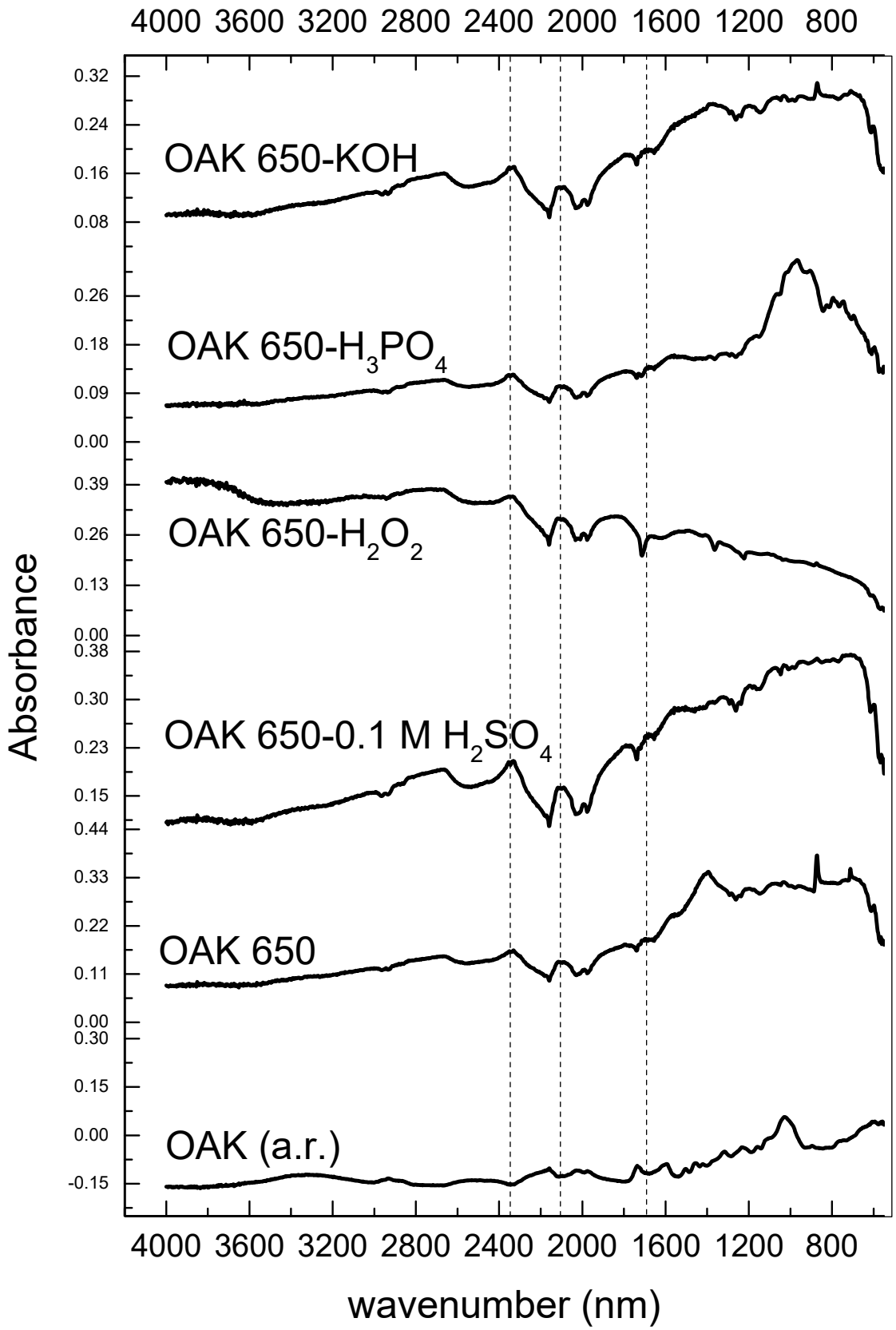
0.26
0.18
0.09
0.00
OAK 250-KOH
0.28
0.19
0.09
0.00
OAK 250-H3PO4
0.26
0.18
0.09
0.00
OAK 250-H2O2
0.33
0.22
0.11
0.00
OAK 250-0.1 M H2SO4
0.26
0.18
0.09
0.00
OAK 250
0.30
0.15
0.00
-0.15
OAK (a.r.)
Absorbance
4000 3600 3200 2800 2400 2000 1600 1200 800
wavenumber (nm)

(b)


4000 3600 3200 2800 2400 2000 1600 1200 800
0.30
0.20
0.10
0.00
OAK 450-KOH
0.33
0.25
0.16
0.08
OAK 450-H3PO4
0.60
0.48
0.36
0.24
OAK 450-H2O2
0.26
0.18
0.09
0.00
OAK 450-0.1 M H2SO4
0.26
0.18
0.09
0.00
OAK 450
0.30
0.15
0.00
-0.15
OAK (a.r.)
Absorbance
4000 3600 3200 2800 2400 2000 1600 1200 800
wavenumber (nm)

(c)



Supplementary Figure S1. FTIR spectra of treated and untreated (a) OAK 250 (b) OAK 450 and (c) OAK 650 chars including unprocessed oak biomass (as received) (4000-500 cm^{-1}; arbitrary y-axis values).