

Supplementary Materials

Table S1 The percentages of different carbon-based functional groups in the three reaction systems calculated from the ^{13}C -CPMAS-NMR spectrum of HA (%)

Chemical Shift (ppm)	Assignment	MnO ₂ (Air)	MnO ₂ (N ₂)	Air
0–45	Alkyl-C	7.72	9.34	10.35
45–60	N,O-Alkyl-C	3.39	4.38	4.19
60–110	Polysaccharide-C	21.04	23.53	28.07
110–140	Aromatic-(C-H, C-C)	23.76	23.91	25.53
140–160	Aromatic-(C-O C-N)	21.48	24.5	19.93
160–180	Carbonyl-C	11.96	8.49	8.49
180–220	Keto/ Aldehyde-C	8.63	5.85	4.44

Notes: Aromatic index = (aromatic C)/(alkyl C + aromatic C + N, O-alkyl C + polysaccharide C). The aromatic index of each reaction system: MnO₂ (Air), 0.58; MnO₂ (N₂), 0.57; Air, 0.51

Table S2 The percentages of different carbon-based functional groups in the three reaction systems calculated from the ^{13}C -CPMAS-NMR spectrum of FA (%)

Chemical Shift (ppm)	Assignment	MnO ₂ (N ₂)	Air	N ₂
0–45	Alkyl-C	9.4	8.55	16.23
45–60	N,O-Alkyl-C	7.95	6.07	8.36
60–110	Polysaccharide-C	30.82	36.88	24.91
110–140	Aromatic-(C-H, C-C)	24.42	23.88	22.47
140–160	Aromatic-(C-O C-N)	20.69	19.26	9.88
160–180	Carbonyl-C	4.38	3.41	10.81
180–220	Keto/ Aldehyde-C	2.34	1.95	7.34

Notes: Aromatic index = (aromatic C)/(alkyl C + aromatic C + N, O-alkyl C + polysaccharide C). The aromatic index of each reaction system: MnO₂ (N₂), 0.48; Air, 0.46; N₂, 0.39