Supporting Information

Catalytic fast pyrolysis of cellulose and biomass to selectively produce levoglucosenone using activated carbon catalyst

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Table S1 The textural properties of the AC catalysts

	AC-P	AC-H_2O	AC-CO_2	AC-Zn	AC-P_R	AC-P_R*
BET surface area (m^2/g)	1189	872	502	937	988	316
Pore volume (cm^3/g)	0.74	0.57	0.36	0.78	0.72	0.31
Average pore diameter (nm)	3.51	2.66	2.89	3.33	3.48	2.53

* After the sixth run in the recycling experiments.

Table S2 Composition of non-condensable gas products from lab-scale catalytic fast pyrolysis of cellulose under different temperatures and AC-P-to-cellulose ratios

AC-P-to-cellulose ratio	Temperature	H_2	CH_4	CO	CO_2
	^oC	vol%	vol%	vol%	vol%
1/5	270	0.36	1.12	32.03	63.97
	300	0.36	1.55	34.12	61.03
	330	0.51	2.23	35.49	58.44
	360	0.59	2.65	39.15	54.16
	390	0.72	2.98	39.71	52.82
	420	1.11	4.31	52.74	37.31
0	300	0.03	0.22	25.82	70.36
1/10		0.12	0.52	33.23	63.14
1/5		0.36	1.55	34.12	61.03
1/4		0.44	1.74	34.73	60.37
1/3		0.44	1.79	34.96	60.33
1/2		0.40	1.77	35.49	60.21
1/1		0.37	0.99	35.21	61.33

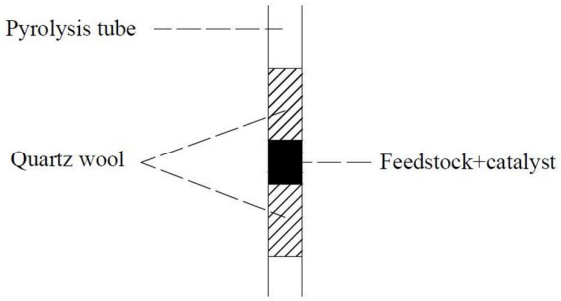

Fig. S1 Experimental sample preparation

The actual yield of LGO was determined individually by the external standard method (external calibration). When different amounts of LGO were subjected to GC/MS to record the peak area values, a straight line (calibration curve) could be obtained in terms of the LGO quantity and its chromatographic peak area value. Based on this calibration line and the feedstock quantity, the actual LGO yields under different reaction conditions could be calculated.

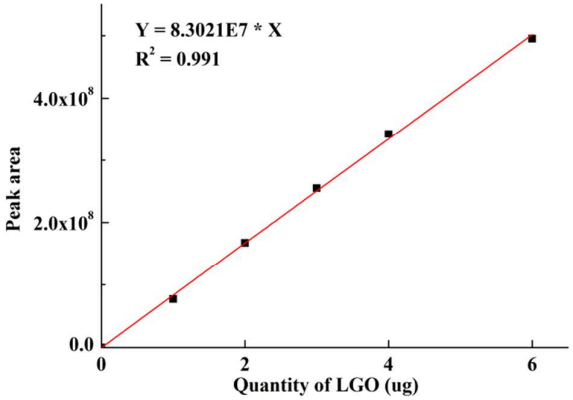

Fig. S2 Calibration curve of LGO

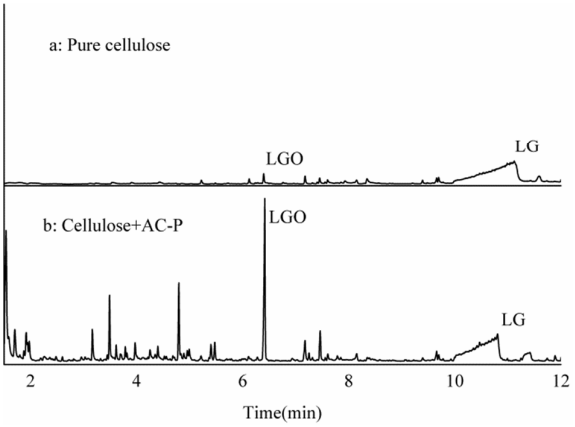

Fig. S3 Typical ion chromatograms of cellulose pyrolysis

(a) non-catalytic pyrolysis at 300 ^{o}C; (b) catalytic pyrolysis at 500 ^{o}C (AC-P-to-cellulose of 1/3)

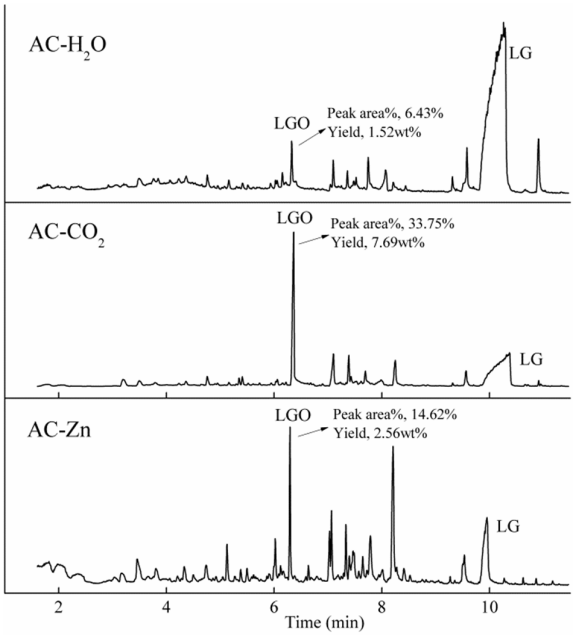

Fig. S4 Typical ion chromatograms of cellulose catalytic pyrolysis with different ACs at 300 ^{o}C and AC-to-cellulose ratio of 1/3

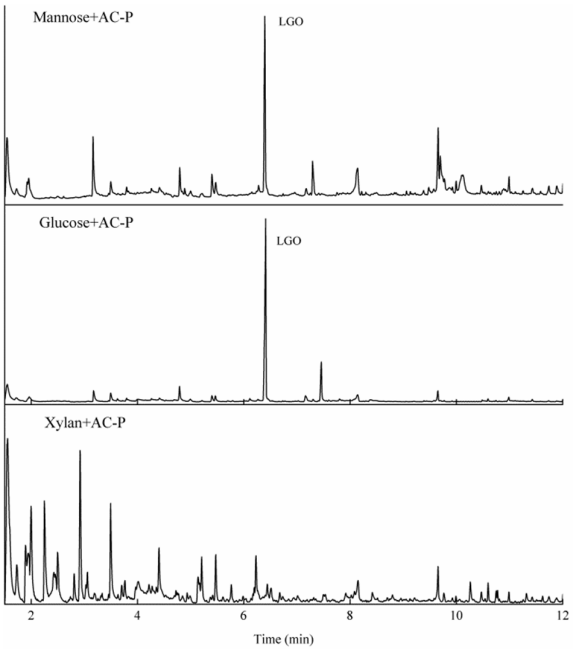

Fig. S5 Typical ion chromatograms of catalytic fast pyrolysis of mannose, glucose and xylan with AC-P at 300 ^{o}C

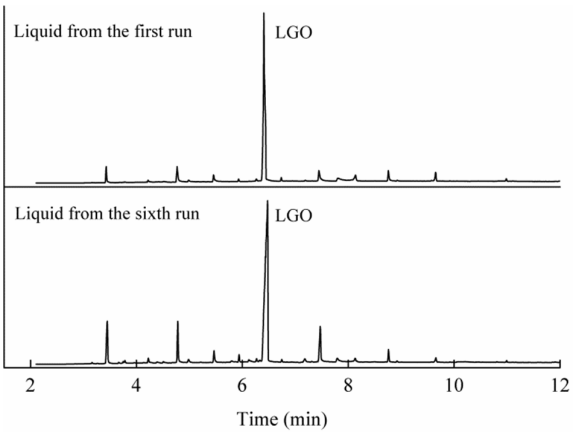

Fig. S6 Typical ion chromatograms from GC/MS analysis of the pyrolytic liquid products obtained in the recycling experiments