Supporting information for

A novel route for flexible preparation of hydrocarbon jet-fuels from biomass based platform chemicals: case of using furfural and 2, 3-butanediol as feedstocks

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Table S1 Specifications of jet A-1 fuel and properties of *n*-nonane and *n*-tetradecane *

Fuel/n-alkane	Carbon number	Energy density (MJ/kg)	Viscosity (mm^2/s)	Flash point (°C)	Density (g/cm^3)	Percentage of naphthalene (Vol. %)	Aromatics (Vol. %)	Freezing point (°C)	Acidity (mg KOH/g)	Boiling point (°C)	Sulfur (wt.%)
Jet A-1 fuel	9-16	42.8 min.	8 max.	38 min.	0.775 min.	3 max.	25 max.	–47 max.	0.015 max.	10% recovery at 205 °C，Final boiling point 300 °C	0.3 max.
n-Nonane	9	48.1	0.7	31	0.718	-	-	-51	-	150.8	-
n-Tetradecane	14	47.8	3.02	100	0.756	-	-	-6	-	255	-

*References:

1. H. Schobert, Chemistry of fossil fuels and biofuels. Cambridge University Press, 2013.

2. H. Li, A. Riisager, S. Saravanamurugan, A. Pandey, R. S. Sangwan, S. Yang, and R. Luque, ACS Catal. 2018, 8, 148−187.

Figure S1 Schematic diagram of the reactive distillation apparatus used in the experiments for carbonaceous solid acid catalyzed dehydration of 2,3-butanediol to form methyl ethyl ketone.

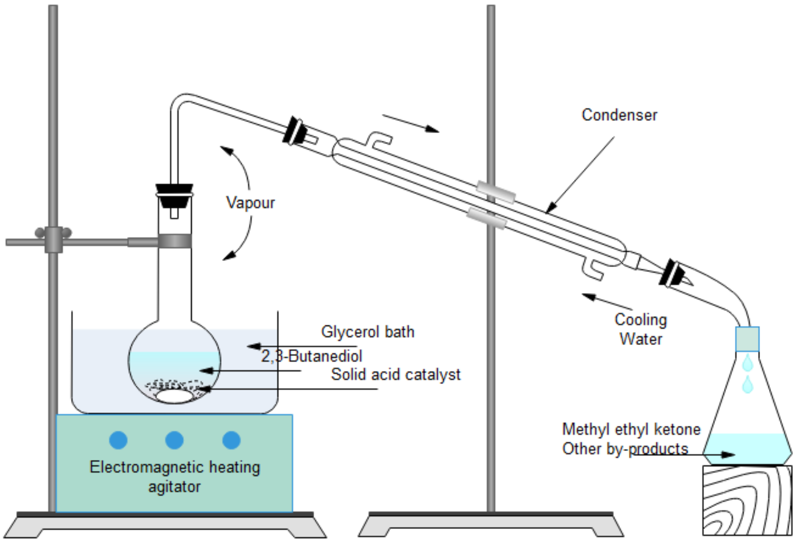
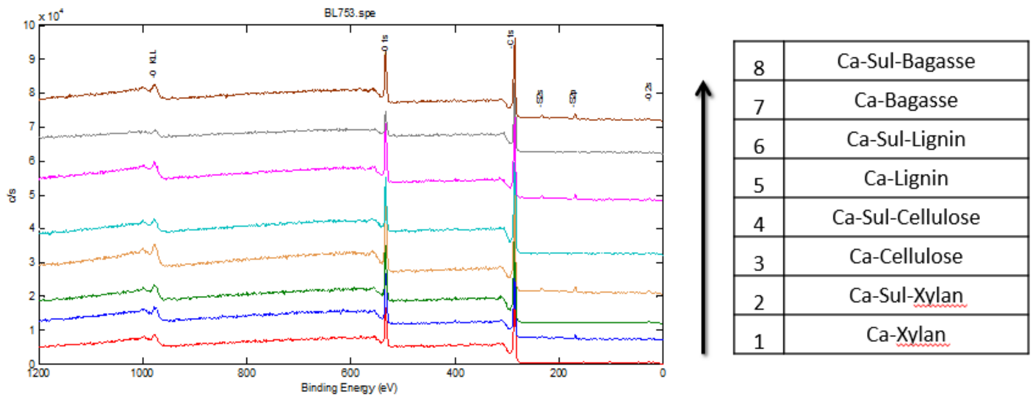


Figure S2 X-ray photoelectron spectroscopy (XPS) of raw biomass feedstocks, carbonized solids and corresponding solid acids prepared by sulfonation with concentrated sulfuric acid. A: XPS spectrum of different carbonized materials and corresponding solid acids; B: XPS sulfur element peak of different carbonized materials and corresponding solid acids. Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse indicate carbonized xylan, filter paper cellulose, acetic acid bamboo lignin and bagasse, respectively; Ca-Sul-Xylan, Ca-Sul-Cellulose, Ca-Sul-Lignin and Ca-Sul-Bagasse represent sulfonated Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse, respectively. Carbonization conditions: 345 ^{o}C, 1.5 h under N_2 atmosphere; Sulfonation conditions: 4 g carbonized material mixed with 200 g 98 % concentrated sulfuric acid, 150 ^{o}C and 250 rpm for 0.5 h**.**

A



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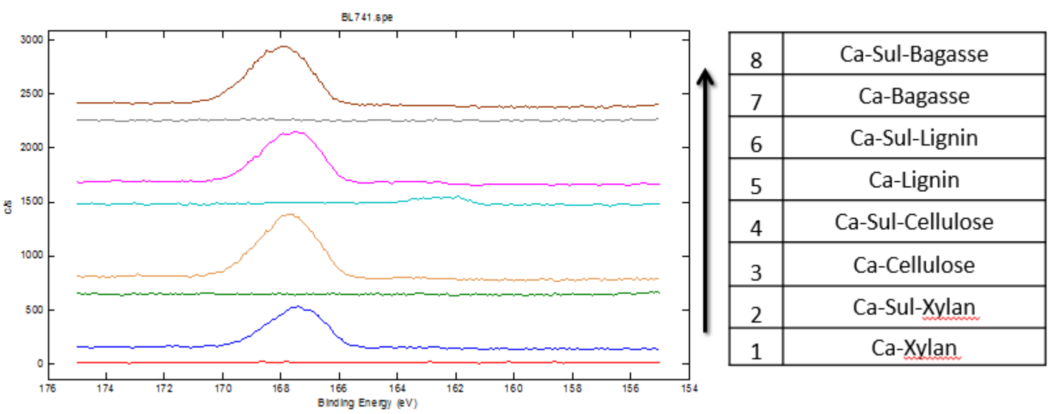


Figure S3 Fourier Transform infrared spectroscopy (FTIR) of raw biomass feedstocks, carbonized solids and corresponding solid acids prepared by sulfonation with concentrated sulfuric acid. Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse indicate carbonized xylan, filter paper cellulose, acetic acid bamboo lignin and bagasse, respectively; Ca-Sul-Xylan, Ca-Sul-Cellulose, Ca-Sul-Lignin and Ca-Sul-Bagasse represent sulfonated Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse, respectively. Carbonization conditions: 345 ^{o}C, 1.5 h under N_2 atmosphere; Sulfonation conditions: 4 g carbonized material mixed with 200 g 98 % concentrated sulfuric acid, 150 ^{o}C and 250 rpm for 0.5 h**.**

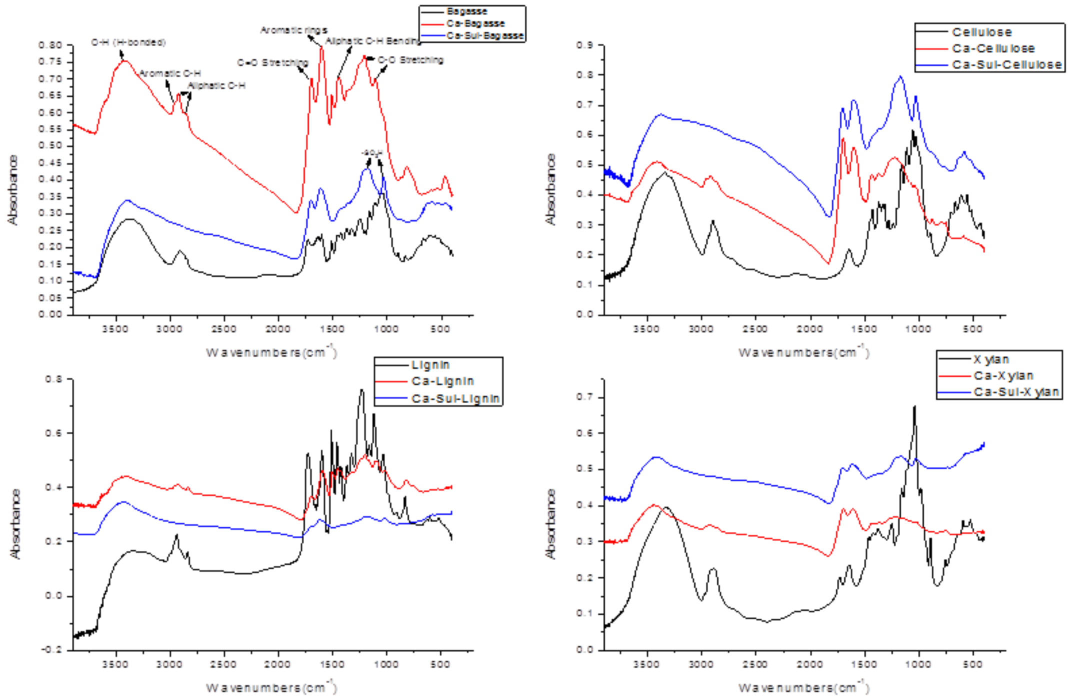


Figure S4 X-ray diffraction (XRD) diagrams of raw biomass feedstocks, carbonized solids and corresponding solid acids prepared by sulfonation with concentrated sulfuric acid. Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse indicate carbonized xylan, filter paper cellulose, acetic acid bamboo lignin and bagasse, respectively; Ca-Sul-Xylan, Ca-Sul-Cellulose, Ca-Sul-Lignin and Ca-Sul-Bagasse represent sulfonated Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse, respectively. Carbonization conditions: 345 °C, 1.5 h under N_2 atmosphere; Sulfonation conditions: 4 g carbonized material mixed with 200 g 98 % concentrated sulfuric acid, 150 °C and 250 rpm for 0.5 h**.**

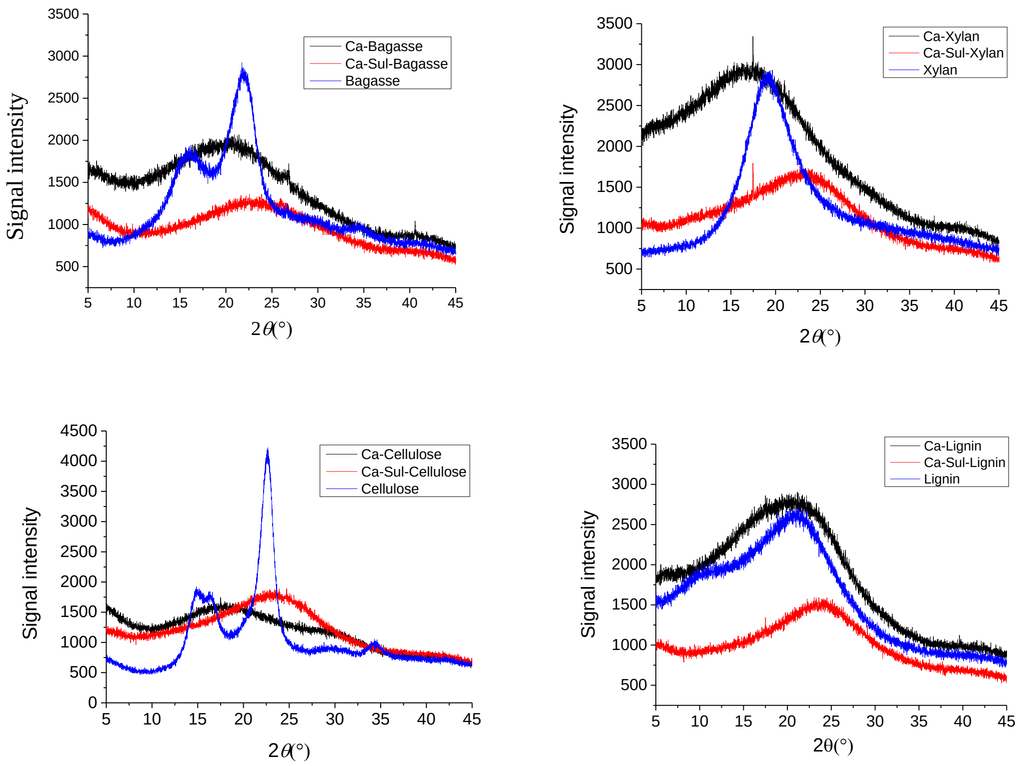
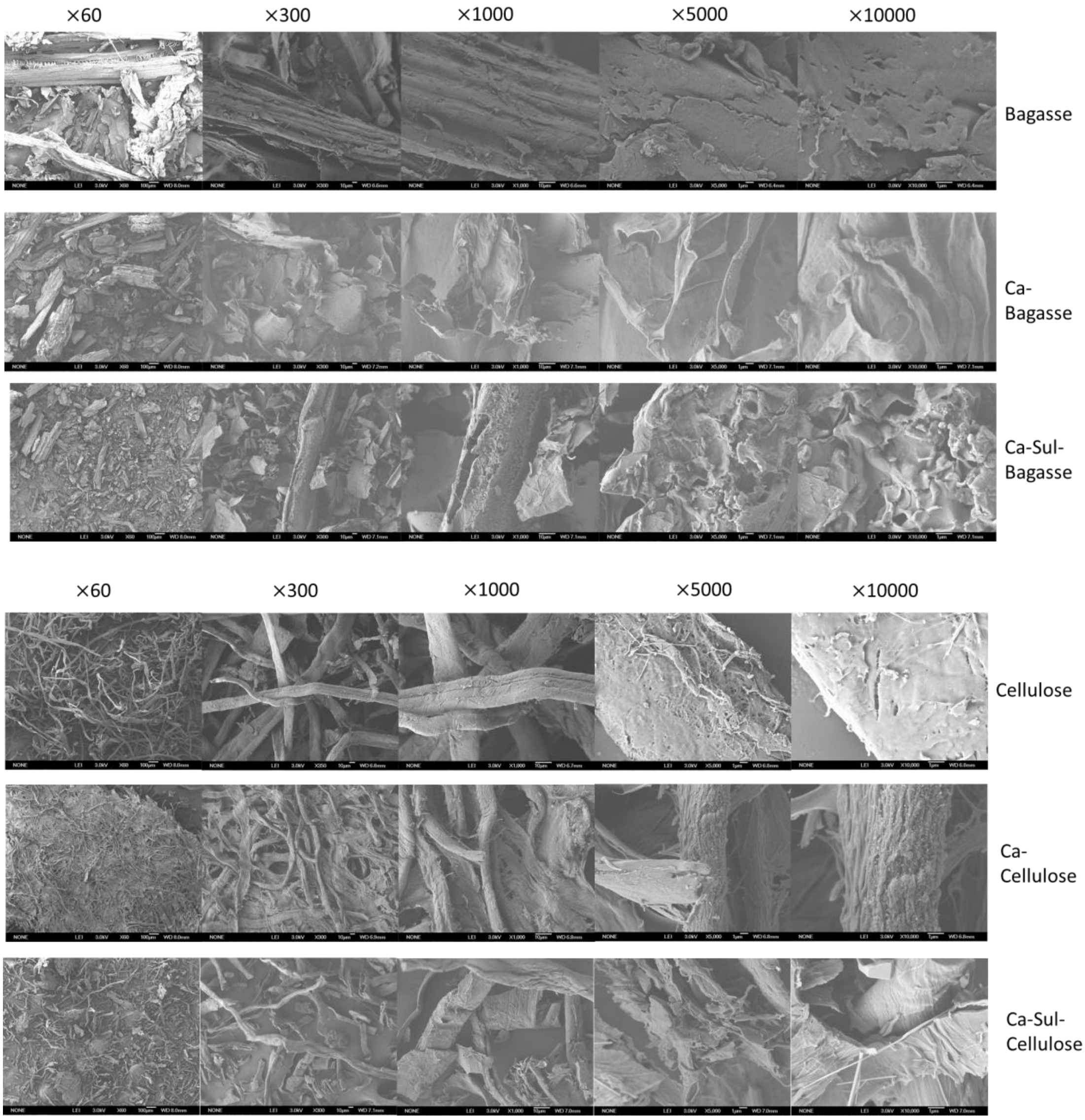
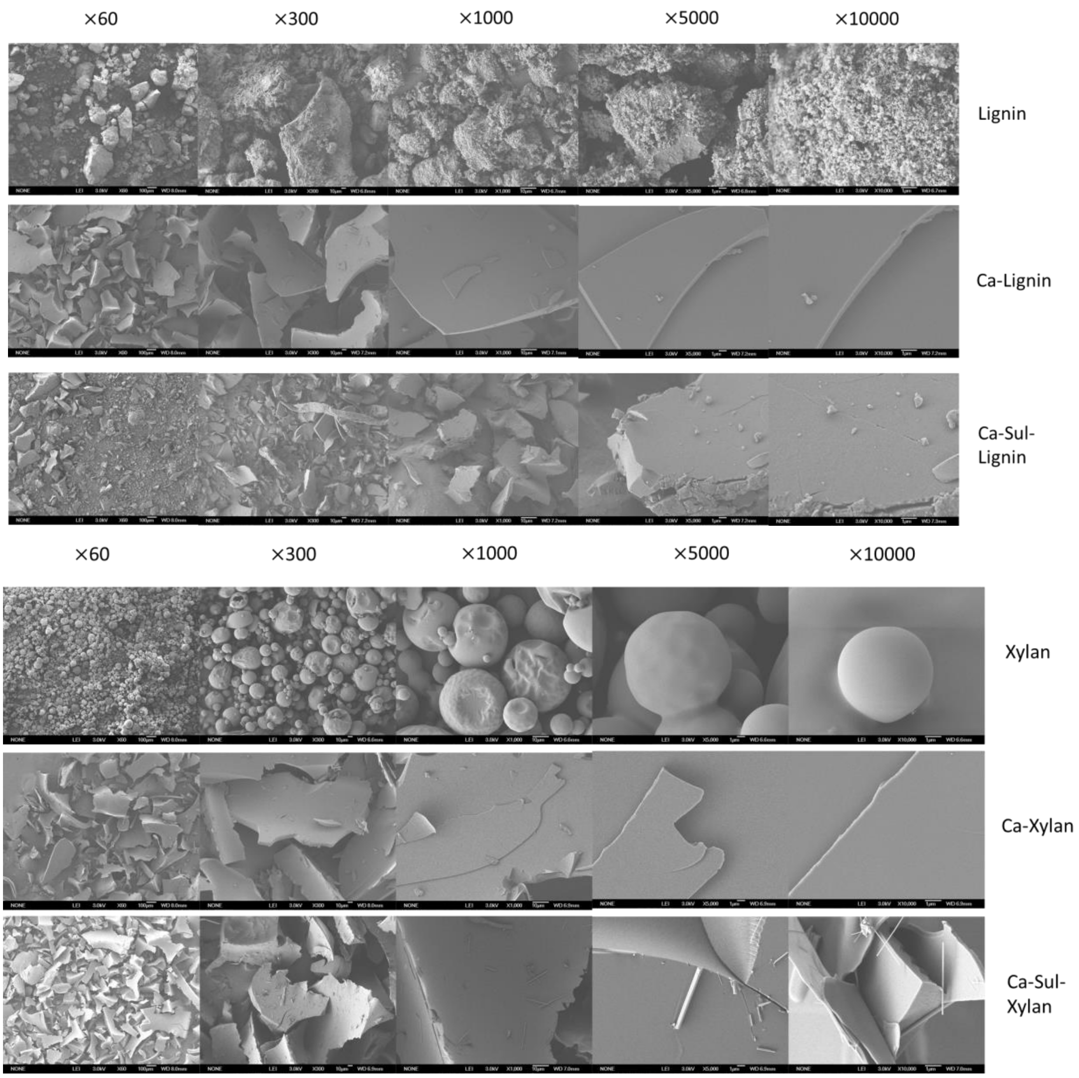


Figure S5 Surface morphology by SEM of raw biomass feedstocks, carbonized solids and corresponding solid acids prepared by sulfonation with concentrated sulfuric acid. Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse indicate carbonized xylan, filter paper cellulose, acetic acid bamboo lignin and bagasse, respectively; Ca-Sul-Xylan, Ca-Sul-Cellulose, Ca-Sul-Lignin and Ca-Sul-Bagasse represent sulfonated Ca-Xylan, Ca-Cellulose, Ca-Lignin and Ca-Bagasse, respectively. Carbonization conditions: 345 ^{o}C, 1.5 h under N_2 atmosphere; Sulfonation conditions: 4 g carbonized material mixed with 200 g 98 % concentrated sulfuric acid, 150 ^{o}C and 250 rpm for 0.5 h**.**




×60
×300
×1000
×5000
×10000
Lignin
Ca-Lignin
Ca-Sul-Lignin
×60
×300
×1000
×5000
×10000
Xylan
Ca-Xylan
Ca-Sul-Xylan