

Figure S1

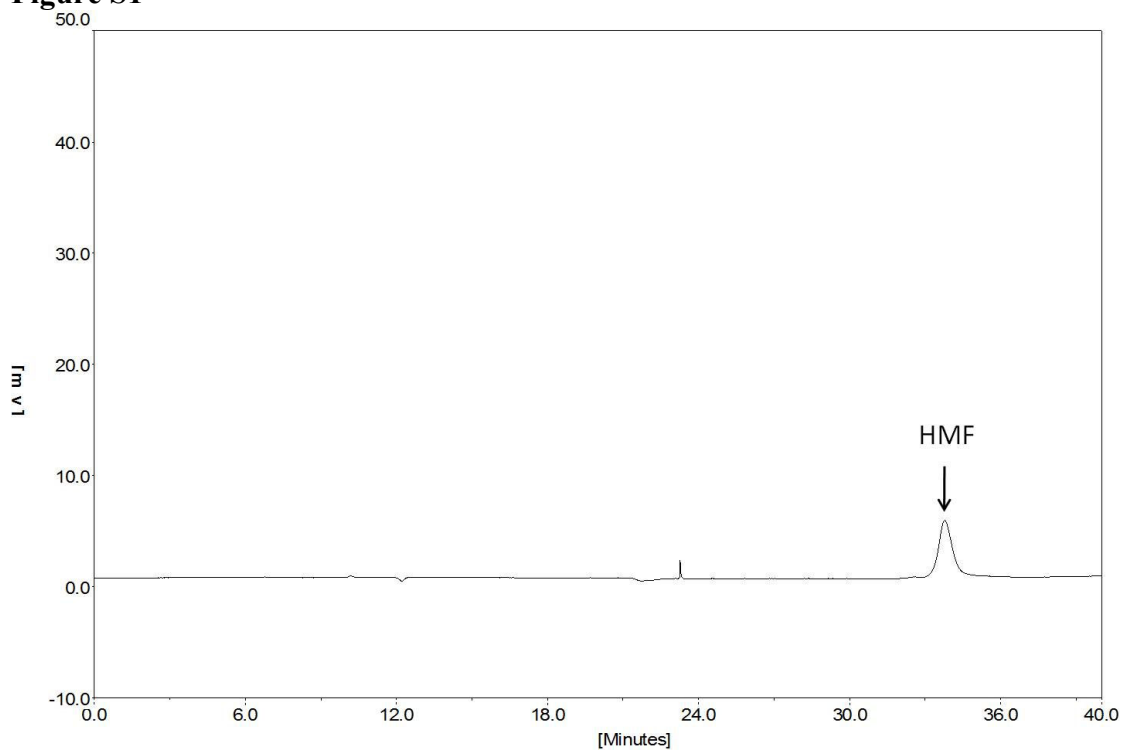


Figure S1. A typical HPLC spectrum of HMF standard. The position of the HMF peak is located at 33.76 min.

Figure S2

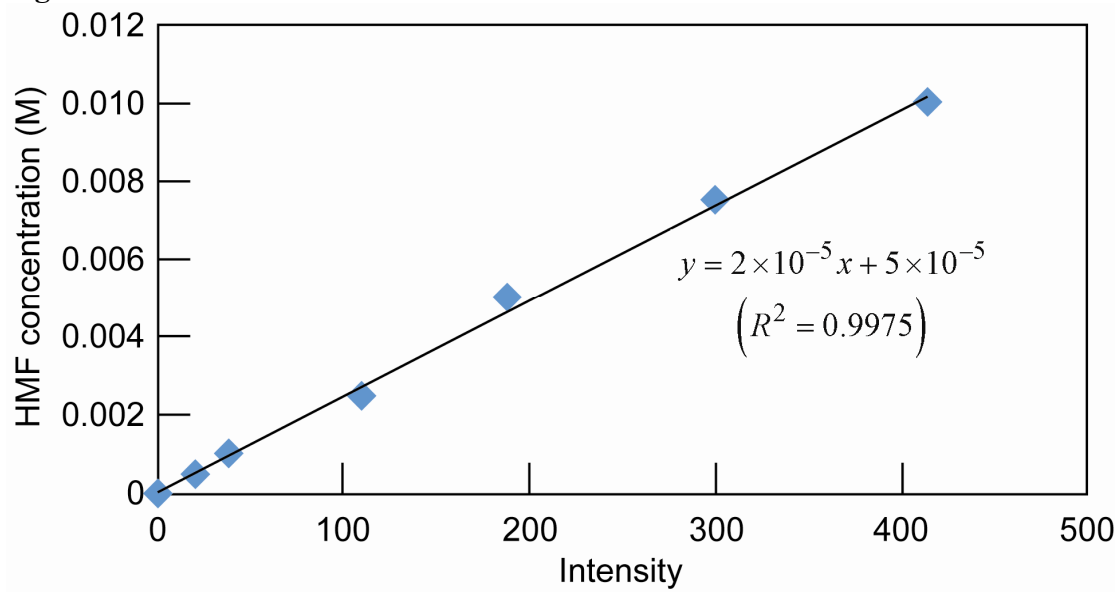


Figure S2. A calibration curve of HMF.

Figure S3

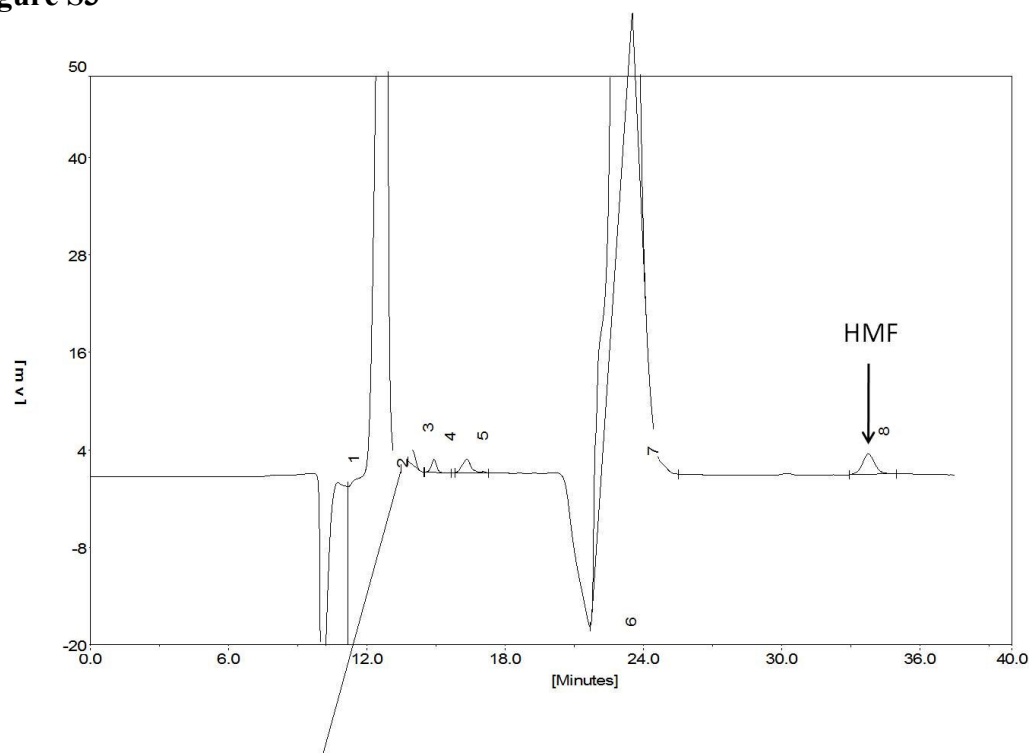


Figure S3. A HPLC spectrum for one of our final products.

The calculation of the HMF yield in our system:

Calibration curve (Figure S2): $y = 2 \times 10^{-5}x + 5 \times 10^{-5}$

HMF intensity (Figure S3): 94.33mV

$$\therefore \text{HMF concentration} = 5 \times (2 \times 10^{-5} \times 94.33 + 5 \times 10^{-5}) = 0.009683M$$

(Because we diluted our liquid product 5 times before the HPLC analysis, the real concentration of HMF in our liquid product needs to be adjusted by multiplying 5.)

$$\therefore \text{HMF amount in our liquid product} = 0.009683 \times 0.002 = 1.9366 \times 10^{-5} \text{ mol}$$

(The volume of our liquid is 2 mL)

Cellulose: 0.0151g $\Rightarrow 9.26 \times 10^{-5} \text{ mol}$ based on glucose unit

$$\therefore \text{HMF yield} = 1.9366 \times 10^{-5} \text{ mol} / 9.26 \times 10^{-5} \text{ mol} = 20.78\%$$

Figure S4

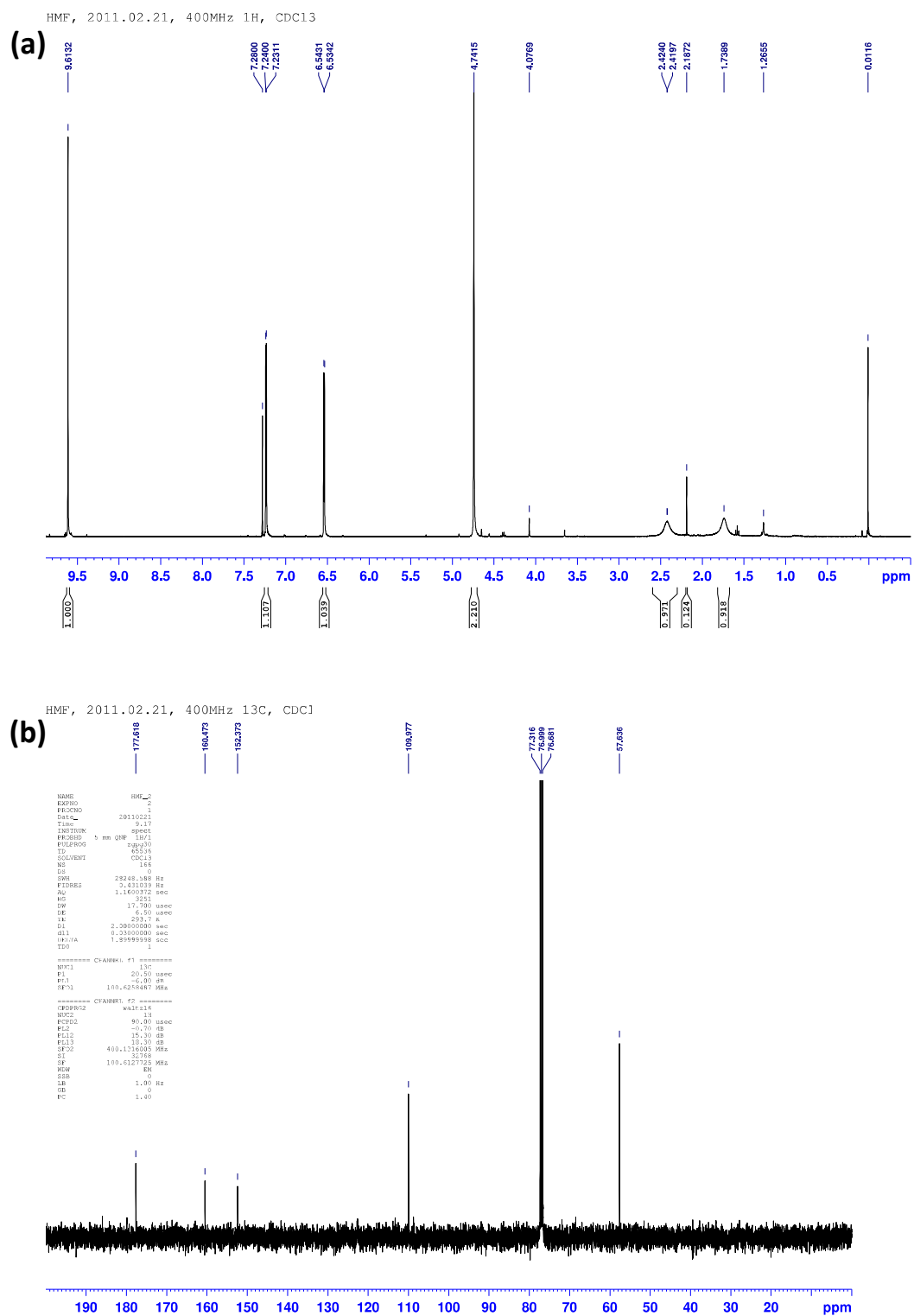


Figure S4. (a) ¹H and (b) ¹³C NMR spectra of HMF standard in CDCl₃.

Figure S5

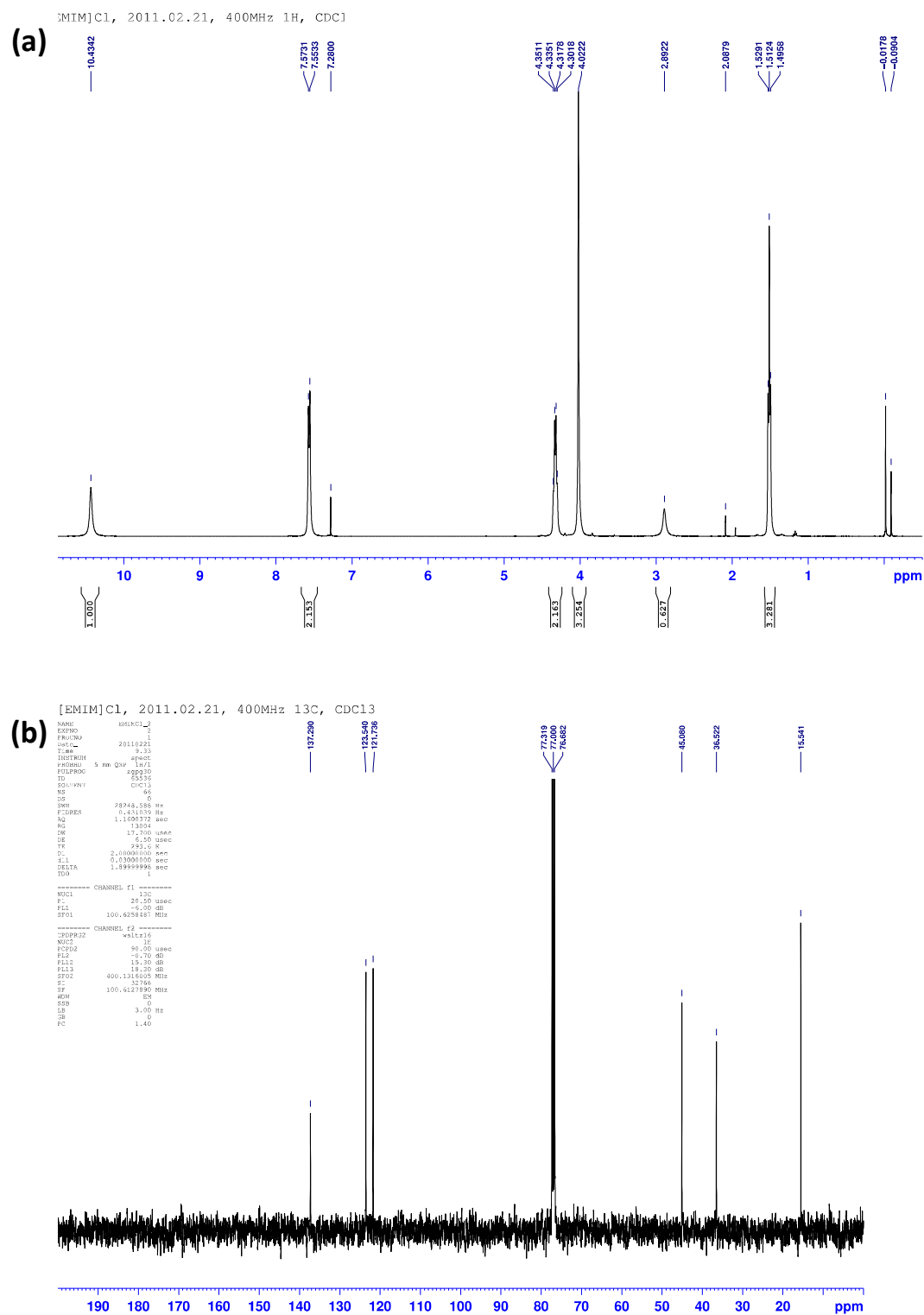


Figure S5. (a) ¹H and (b) ¹³C NMR spectra of [EMIM]Cl standard in CDCl₃.

Figure S6

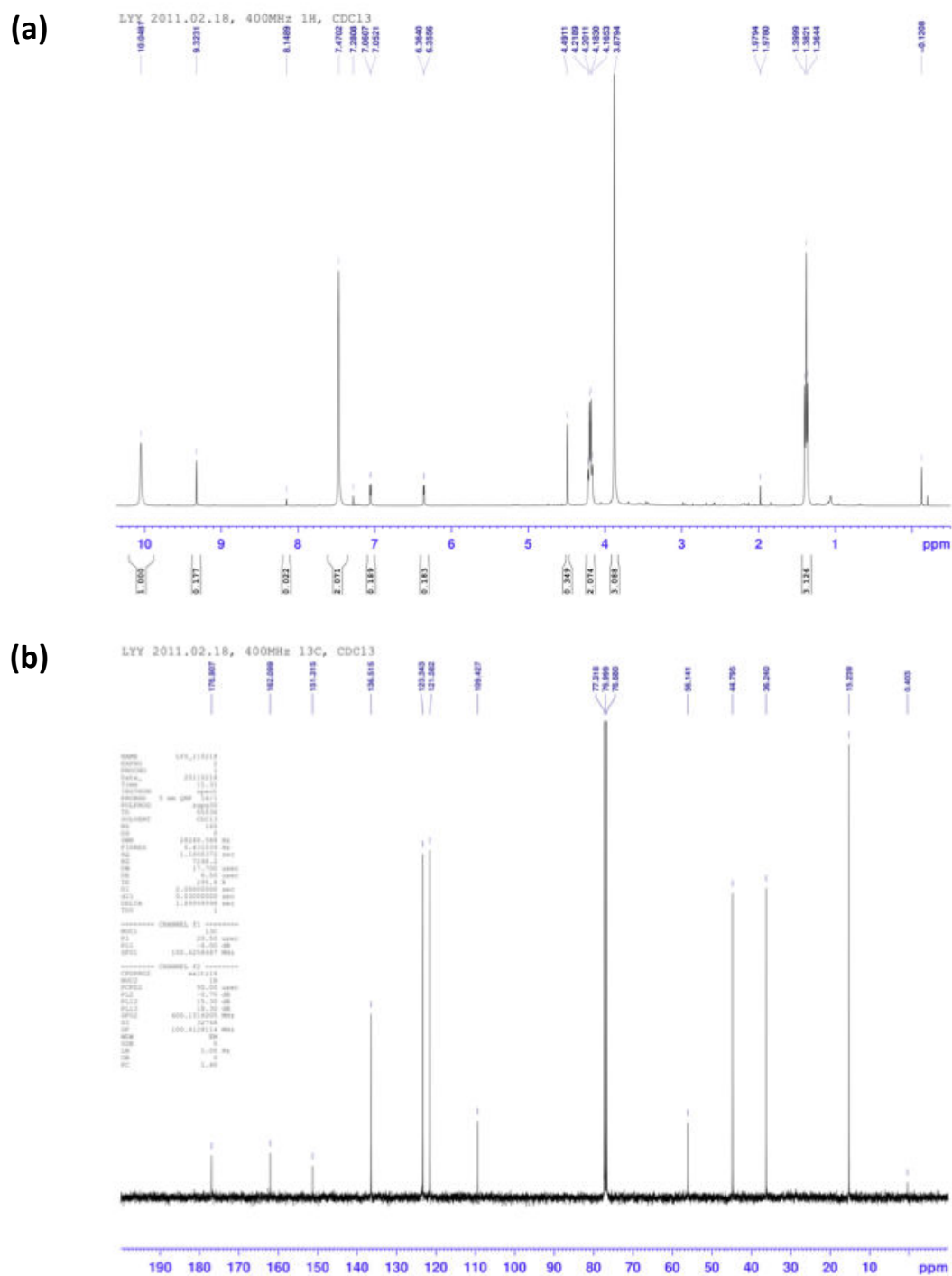


Figure S6. (a) ¹H and (b) ¹³C NMR spectra of our product standard in CDCl₃.

Figure S7

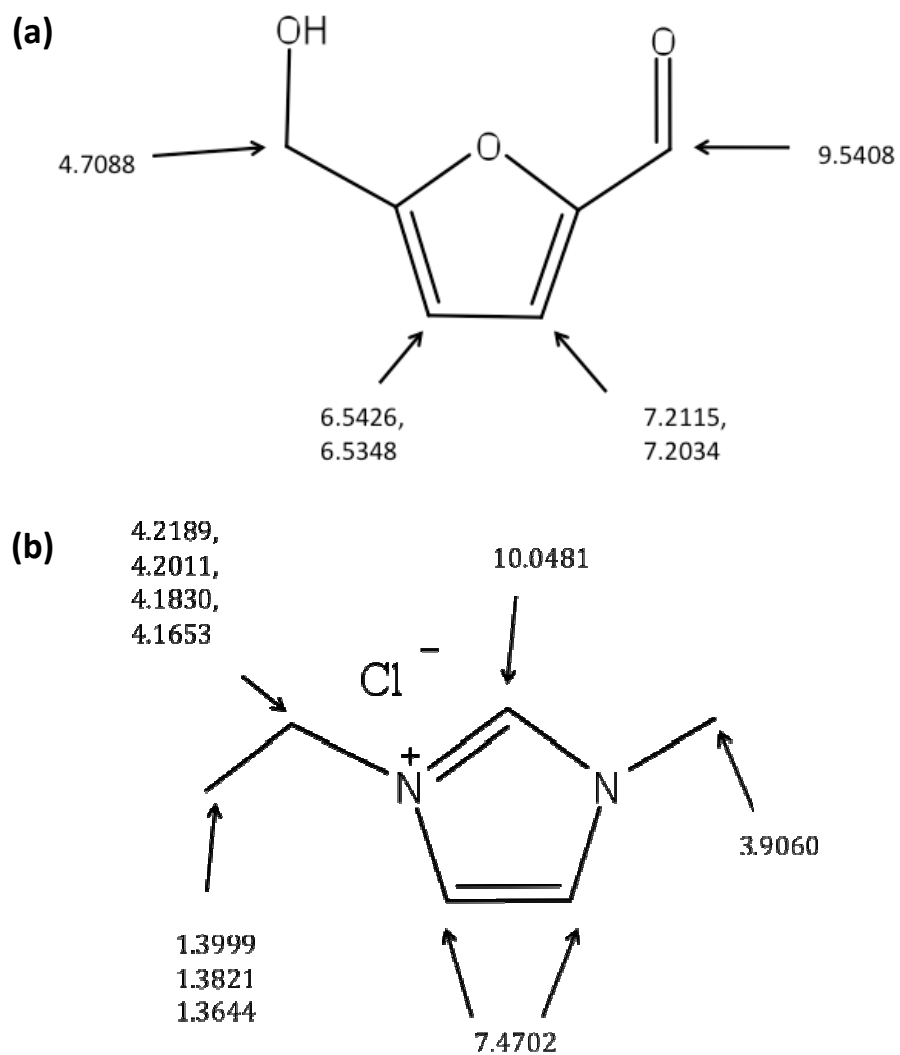


Figure S7. Peak positions and the corresponding chemical structures of (a) HMF and (b) [EMIM]Cl in ^1H NMR spectrum.

Figure S8

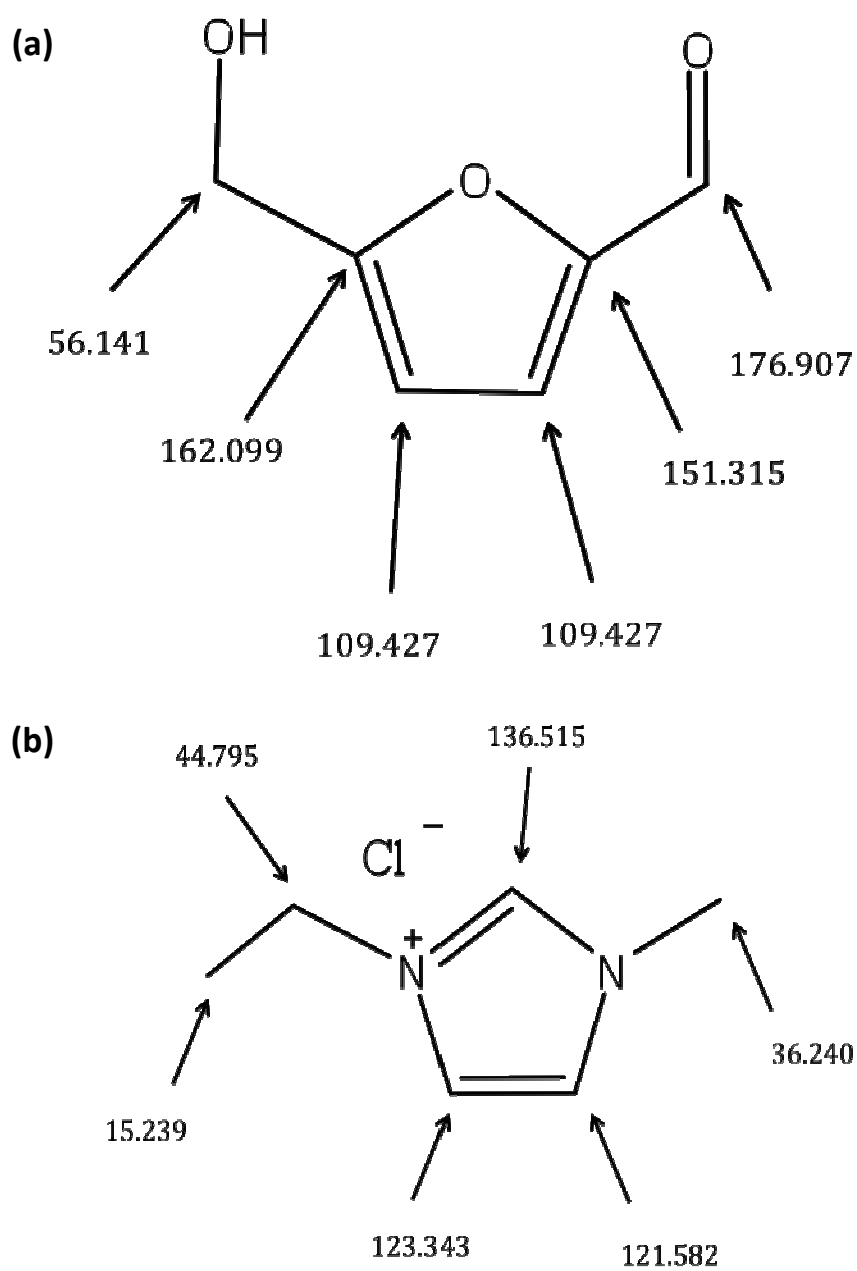


Figure S8. Peak positions and the corresponding chemical structures of (a) HMF and (b) [EMIM]Cl in ^{13}C NMR spectrum.

Figure S9

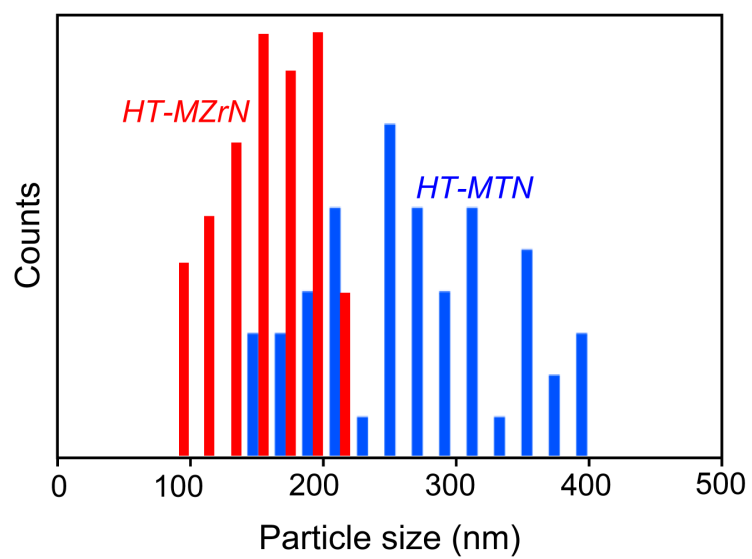


Figure S9. Particle size distribution of hydrothermally treated MTN (HT-MTN) and MZrN (HT-MZrN).

Figure S10

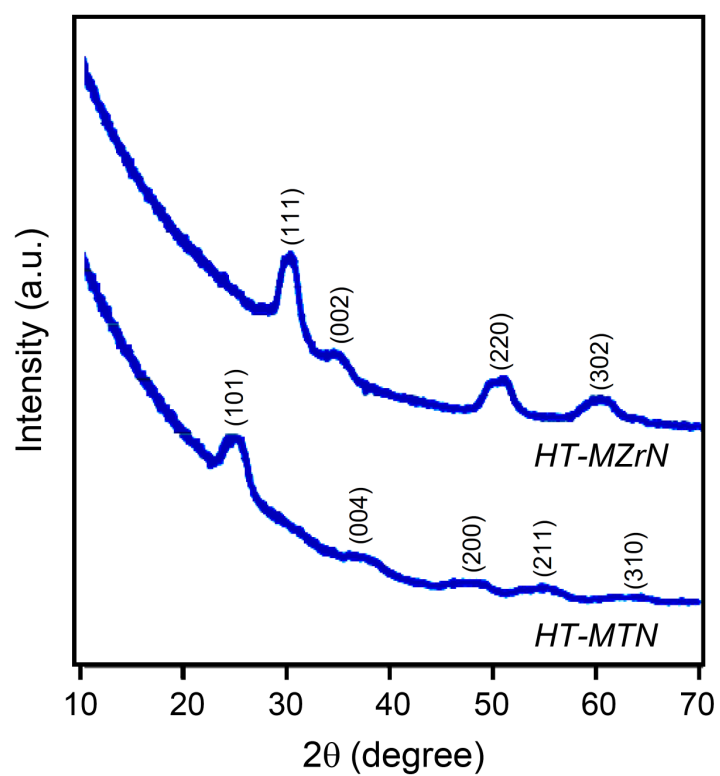


Figure S10. XRD patterns of hydrothermally treated MTN (HT-MTN) and MZrN (HT-MZrN).

Figure S11

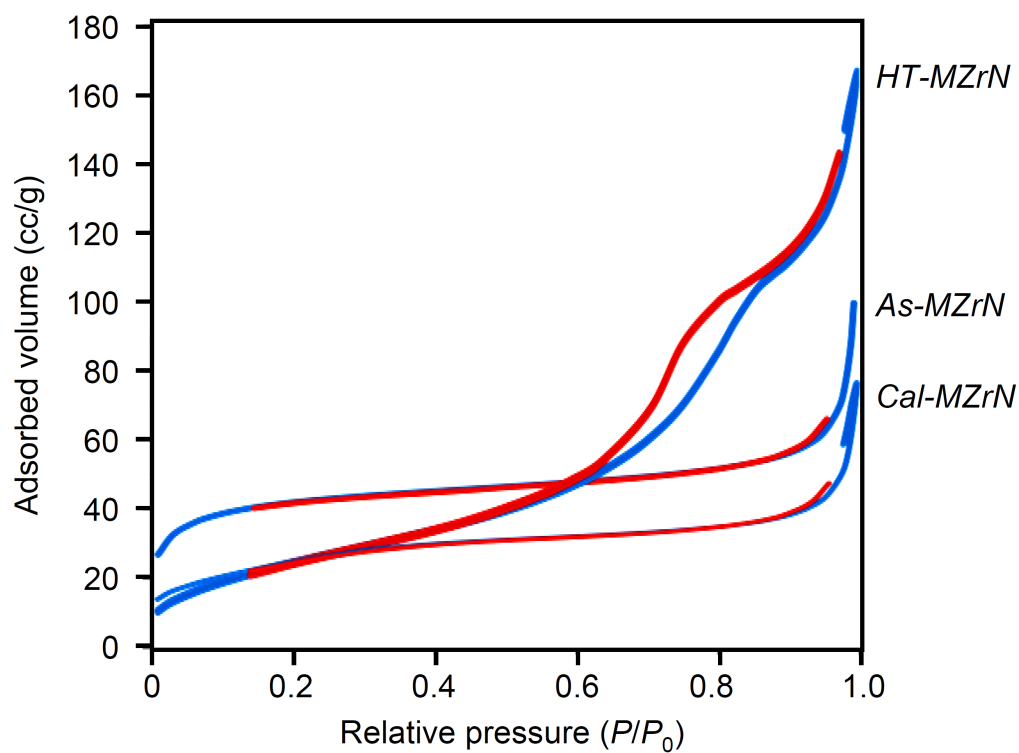


Figure S11. Nitrogen adsorption-desorption isotherms of amorphous MZrN (MZrN), hydrothermally treated MZrN (HT-MZrN), and calcined MZrN (Cal-MZrN).

Table S1. Summary of structural and acidic properties of HT-MTN and commercialized titania P25.

Sample	Particle size (nm)	Pore size (nm)	Surface area (m ² /g)	Crystalline phase	Acidic strength (°C)	Acidic amount (mmol/g)	Yield of glucose (%)	Yield of HMF (%)	Total yield (%)
HT-MTN	257.3	11.0	53.0	Anatase	290	1.924	12.9	18.2	31.0
P25	25.0	N/A	49.3	Anatase (80%) + Rutile (20%)	280	1.520	8.30	12.6	20.9