Electronic Supplementary Material (ESI) for RSC Advances.
This journal is © The Royal Society of Chemistry 2018

Supporting Information

Enhancing the conversion of ethyl levulinate to γ-valerolactone over Ru/UiO-66 by introducing sulfonic groups into the framework

Jie Yang*, Wenjuan Huang, Yongsheng Liu, Tao Zhou

School of Mathematics and Physics, Shanghai University of Electric Power, Shanghai, 200090, China

Correspondence: yj_7667@aliyun.com

Synthesis of UiO-66 and its analogues

Preparation of UiO-66

$ZrCl_4$ (0.265 g) and 1,4-benzenedicarboxylic acid (H_2BDC) (0.264 g) were dissolved in DMF (35 mL) at room temperature. The resulting mixture was placed in a Teflon-lined autoclave in a preheated oven at 120 °C for 3 day. After the solution was cooled to room temperature in air, the resulting solid was filtered and repeatedly washed with absolute ethanol for 3 days while heated at 60 °C in an oil bath. The resulting powder was filtered, and dried under vacuum at 50 °C.

Preparation of UiO-66-SO_3H

0.265 g of $ZrCl_4$ and 0.305 g of 2-$NaSO_3$–H_2BDC were dissolved in DMF (35 mL) at room temperature. 5 mL of acetic acid was added later. The resulting mixture was placed in a Teflon-lined autoclave in a preheated oven at 120 °C for 3 day. After the solution was cooled to room temperature in air, the resulting solid was filtered and repeatedly washed with absolute ethanol for 3 days while heated at 60 °C in an oil bath. The resulting powder was filtered, and dried under vacuum at 50 °C.

Preparation of UiO-66-NO_2

According to the literature, $ZrCl_4$(0.75 g) and 2-nitro-benzenedicarboxylic acid (O_2N-H_2BDC) (0.676 g) were dissolved in DMF (90 mL) at room temperature. The resulting mixture was placed in a Teflon-lined autoclave in a preheated oven at 120 °C for 3 day. After the solution was cooled to room temperature in air, the resulting solid was filtered and repeatedly washed with absolute ethanol for 3 days while heated at 60 °C in an oil bath. The resulting powder was filtered, and dried under vacuum at 50 °C.

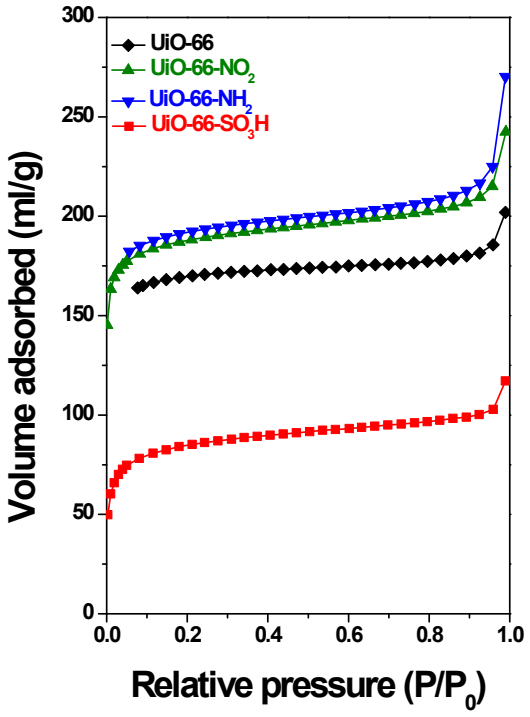

Fig.S1 N_2 adsorption isotherms of UiO-66 and UiO-66-X at 77K.

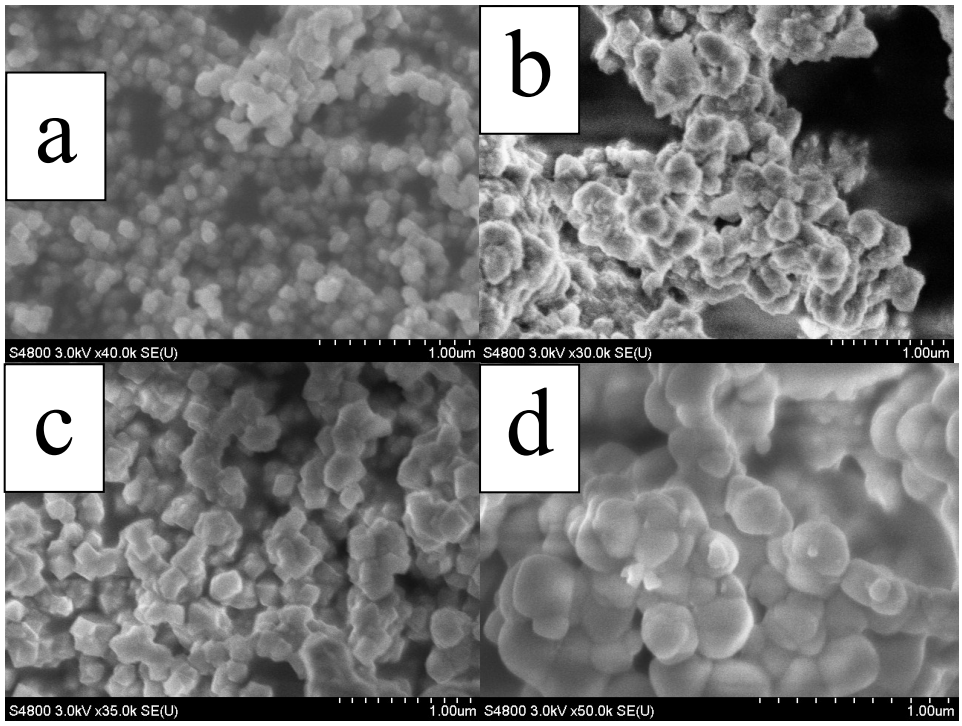

Figure S2 SEM images of UiO-66 and its functionalized analogues: (a) UiO-66, (b) UiO-66-NO_2, (c) UiO-66-NH_2, and (d) UiO-66-SO_3H.

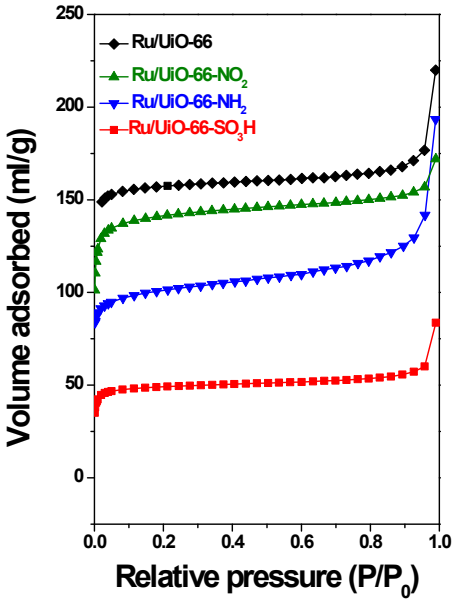

Fig. S3 N_2 adsorption isotherms of Ru/UiO-66 and Ru/UiO-66-X at 77K.

Table S1 Catalytic performance of Ru/UiO-66 and Ru/UiO-66-SO_3H for EL hydrogenation in water. [a]

Entry	Catalysts	Conv.(%)	Sel.(%)		
			GVL	EHP	LA
1	Ru/UiO-66	100	100	0	0
2	Ru/UiO-66-SO_3H	100	100	0	0

[a] Reaction conditions: EL (0.34 mL), Ru/support (100 mg), solvent (9.6 mL), 80 °C, 5 h, H_2 0.5MPa.