Electronic Supplementary Information

Heteropoly acid-encapsulated metal-organic frameworks as a stable and highly efficient nanocatalyst for esterification reaction

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Table 1S Variables and experimental design levels for response surface

Variable	Symbol	Levels		
		-1	0	1
Reaction time / h	X_1	3	4	5
Reaction temperature / ℃	X_2	150	160	170
Catalyst amount / wt.%	X_3	3	7	11

Table 2S Central composite design matrix and the responses of the dependent variables

Standard order	X_1	X_2	X_3	Conversion/%	
				Experimental	Predicted
1	-1	-1	0	63.00	63.74
2	1	-1	0	80.90	82.09
3	-1	1	0	78.10	77.24
4	1	1	0	86.20	85.79
5	-1	0	-1	66.30	66.93
6	1	0	-1	77.00	77.18
7	-1	0	1	71.30	70.78
8	1	0	1	88.40	87.43
9	0	-1	-1	74.70	73.49
10	0	1	-1	75.40	75.79
11	0	-1	1	74.30	74.24
12	0	1	1	87.60	89.14
13	0	0	0	77.90	79.81
14	0	0	0	79.20	79.81
15	0	0	0	81.00	79.81
16	0	0	0	80.20	79.81
17	0	0	0	81.40	79.81

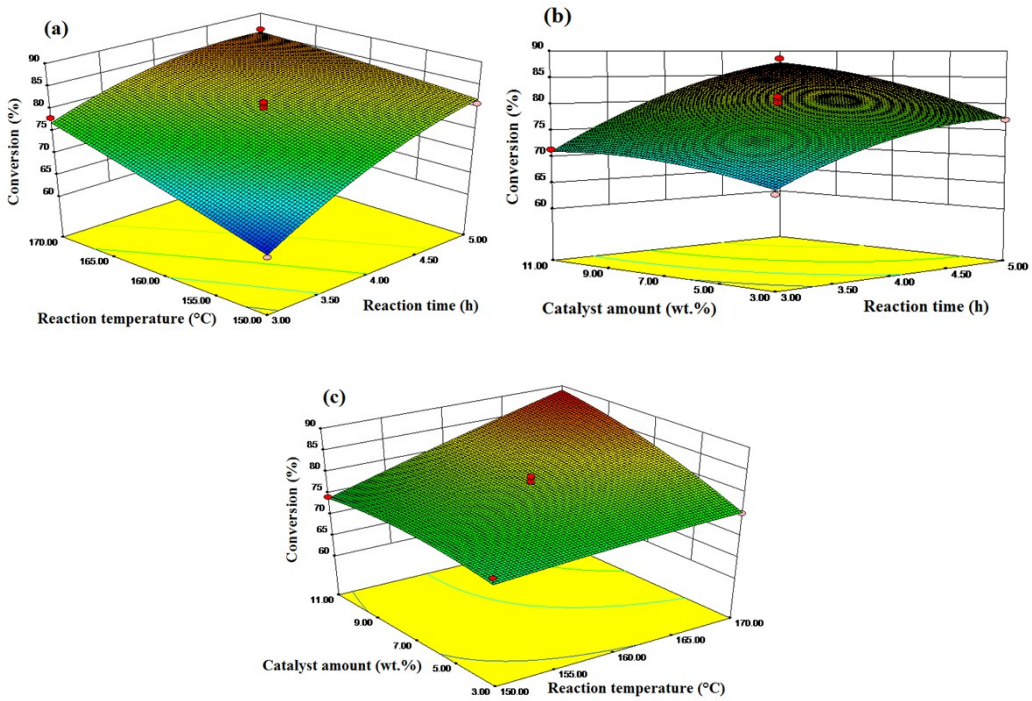

Fig. 1S. 3-D response surface and contour plot of lauric acid conversion (a) reaction temperature and reaction time, (b) catalyst amount and reaction time, (c) catalyst amount and reaction temperature.

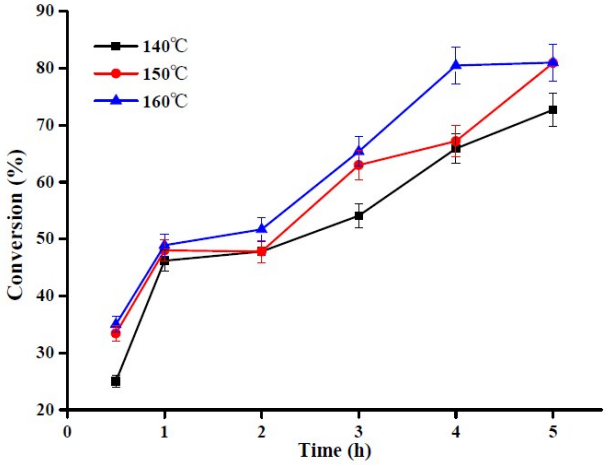

Fig. 2S. Esterification of lauric acid with methanol over HSiW-UiO-66 nanocatalyst at different reaction temperatures.

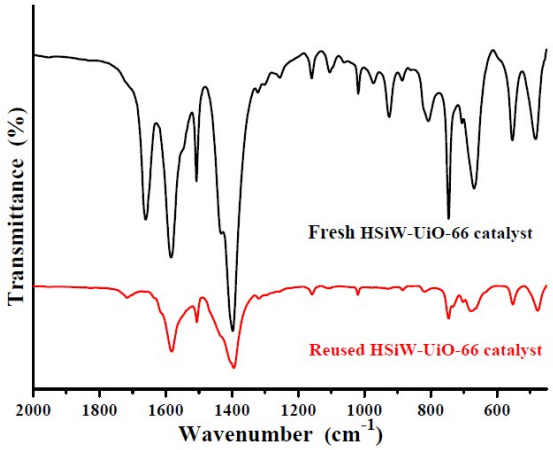

Fig. 3S. The comparison of FT-IR spectra of fresh HSiW-UiO-66 catalyst and reused HSiW-UiO-66 catalyst.