Supporting Information

Effective conversion of glucose to 1,3-propanediol and ethanol via multifunctional iron foam

catalysts

Jiacheng Ji^{1, 2}, Honglin Zhuang¹, Ling Zhou*³, Yi Zhang*¹

¹ College of Chemical Engineering, Beijing University of Chemical Technology, Beijing

100029, China

² Sinopec Engineering Incorporation, Beijing 100101, China

³ Modern Agricultural Engineering Key Laboratory at Universities of Education Department

of Xinjiang Uygur Autonomous Region, Tarim University, Alar, Xinjiang Uygur Autonomous

Region 843300, China

*Corresponding Authors: Tel &Fax:86-10-64436991

Email: zhoul-007@163.com (L.Z.); yizhang@mail.buct.edu.cn (Y.Z.)



Fig. S1 XRD pattern of the (A) fresh, (B) initial, and (C) steady catalysts. (D) and (E) the detailed XRD pattern of the Zr/CoW/FF and CoW/FF in the initial (2nd hour) and steady (20th hour) states respectively. (a) Zr/CoW/FF, (b) CoW/FF, (c) FF, and (d) CoWO₄. The initial and steady catalysts are the samples of the 2nd and 20th hour, respectively

Table S1 H_2 desorption amount of various reduced catalysts ^a

Catalysts ^b	CoW/FF	Zr/CoW/FF	FF	CoWO ₄
H ₂ desorption amount /	50.8	52.7	59.2	24.2
$\mu mol \cdot g_{cat}^{-1}$	50.8	52.1		54.5

a: H_2 desorption amount was calculated by H_2 -TPD.

b: The samples were pre-treated by H_2 at 300 °C before the test.

Table S2 Results of W $4f^{7/2}$ XPS of various catalysts in the initial (2nd hour) and steady (20th hour) states

State Catalysts		B.E. of W 4f	B.E. of W $4f^{7/2}$ XPS / eV		Surface content of W species / %	
		W^{6+}	W ⁵⁺	W ⁶⁺	W ⁵⁺	
Z Initial	Zr/CoW/FF	36.0	35.3	11.2	88.8	
	CoW/FF	35.8	35.1	53.4	46.6	
	CoWO ₄	35.6	34.9	93.7	6.3	
Steady	Zr/CoW/FF	35.8	35.1	31.3	68.7	
	CoW/FF	35.6	34.9	67.2	32.8	
	CoWO ₄	35.4	34.7	97.4	2.6	

State Catalysts		B.E. of Fe $2p^{3/2}$ XPS / eV		Surface content of Fe species / %			
State		Fe ³⁺	Fe ²⁺	Fe ⁰	Fe ³⁺	Fe ²⁺	Fe ⁰
	Zr/CoW/FF	712.8	710.6	708.9	40.3	51.6	8.1
Initial	CoW/FF	712.3	710.4	708.7	55.9	36.9	7.2
	FF	713.0	710.9	709.1	37.3	52.3	10.4
Steady	Zr/CoW/FF	712.3	710.4	708.7	45.5	47.3	7.2
	CoW/FF	712.0	710.2	708.5	62.9	31.4	5.7
	FF	712.5	710.6	708.9	50.6	41.2	8.2

Table S3 Results of Fe $2p^{3/2}$ XPS of various catalysts in the initial (2nd hour) and steady (20th hour) states

Table S4 The acid amounts of the various catalysts in the initial (2^{nd} hour) and steady (20^{th} hour) state ^a

Catalysts	Initial state / (µmol/g-cat)		Steady state / (µmol/g-cat)	
	Mid-strong	Strong	Mid-strong	Strong
Zr/Cow/FF	11.04	23.76	15.39	30.96
CoW/FF	7.26	16.29	13.34	22.86
FF	8.70	15.53	13.59	9.84
CoWO ₄	1.56	32.05	17.97	13.45

a: The acidity was calculated by the data of NH₃-TPD.

Catalysts	Initial state	Steady state
Zr/Cow/FF	0.10	0.13
CoW/FF	0.12	0.17
FF	0.07	0.03
CoWO ₄	0	0

Table S5 B/L of the various catalysts in the initial (2^{nd} hour) and steady (20^{th} hour) state ^a

a: The B/L was calculated by the data of Py-FTIR.