Supporting Information

Highly Efficient Catalytic Conversion of Cellulose to Acetol over Ni-Sn Supported on Nanosilica and the Mechanism Study

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Table S1. Cellulose conversion over a series of 5%Ni-15%Sn/SiO_2 catalysts with different preparation conditions

Entry	Catalyst	Yield %					
		Acetol	HB	C_2-C_4 diol	LA	α-HK	Total C3
1	5%Ni-15%Sn/SiO_2-500C	52.8	12.2	1.4	15.3	65	69.1
2	5%Ni-15%Sn/SiO_2-600C	54.5	12.6	0.9	14.9	67.1	69.9
3	5%Ni-15%Sn/SiO_2-400R	53.6	11.5	0.8	14.9	65.1	68.9
4	5%Ni-15%Sn/SiO_2-500R	54.2	13.7	1.5	13.7	67.9	68.5
5	5%Ni-15%Sn/SiO_2	59.6	14.4	1.2	10.5	74	70.8

Reaction conditions: 50 mg of cellulose, 34 mg of catalyst, 10 mL of H_2O, 250 °C, 4 MPa H_2, 1 h.

Table S2. Metal contents of 5%Ni-x%Sn/SiO_2 catalysts.

Catalyst	Content (wt%)[a]		Sn/Ni(wt)	Atom% (Sn/Ni)	
	Ni	Sn		Bulk	Surface [b]
5%Ni/SiO_2	5.19	--	--	--	--
5%Ni-5%Sn/SiO_2	4.74	5.54	1.17	0.58	0.56
5%Ni-10%Sn/SiO_2	5.16	11.4	2.21	1.09	1.32
5%Ni-15%Sn/SiO_2	5.31	16.36	3.08	1.52	1.81
5%Ni-20%Sn/SiO_2	4.94	21.37	4.33	2.14	2.47
5%Ni-25%Sn/SiO_2	4.87	25.75	5.29	2.62	3.48

a measured by AAS; b measured by XPS.

Table S3. L-acid concentrations of Ni-Sn/SiO_2 catalysts.

Catalyst	C(mmol/g)
5%Ni/SiO_2	0.018
5%Ni-5%Sn/SiO_2	0.044
5%Ni-10%Sn/SiO_2	0.063
5%Ni-15%Sn/SiO_2	0.046
5%Ni-20%Sn/SiO_2	0.039
5%Ni-25%Sn/SiO_2	0.028
15%Sn/SiO_2	0.042

Table S4. CO_2 desorption peaks area of Ni-Sn/SiO_2 catalysts.

Catalyst	CO_2 desorption area
5%Ni/SiO_2	258
5%Ni-5%Sn/SiO_2	379
5%Ni-10%Sn/SiO_2	620
5%Ni-15%Sn/SiO_2	1948
5%Ni-20%Sn/SiO_2	1866
5%Ni-25%Sn/SiO_2	1287

Table S5. Metal contents of 5%Ni-15%Sn/SiO_2 before and after recycle.

	Content (wt%)		
Catalyst	Ni	Sn	Sn/Ni
Fresh	5.31	16.36	3.08
After 5 runs	5.2	14.76	2.84

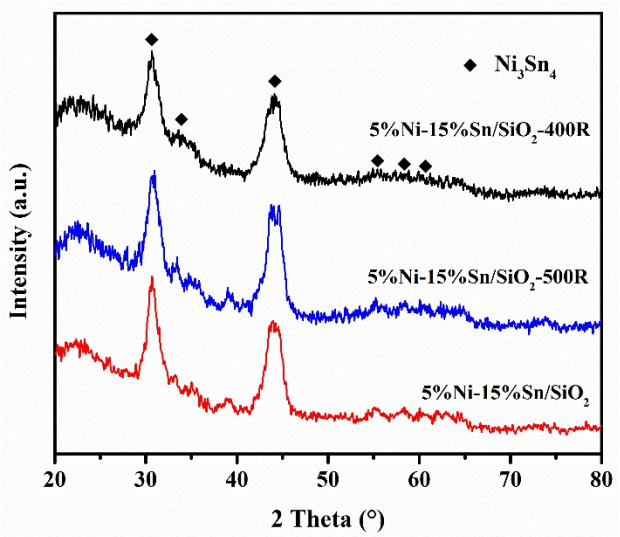

Figure S1. XRD patterns of 5%Ni-15%Sn/SiO_2 catalysts with different reduction temperature.

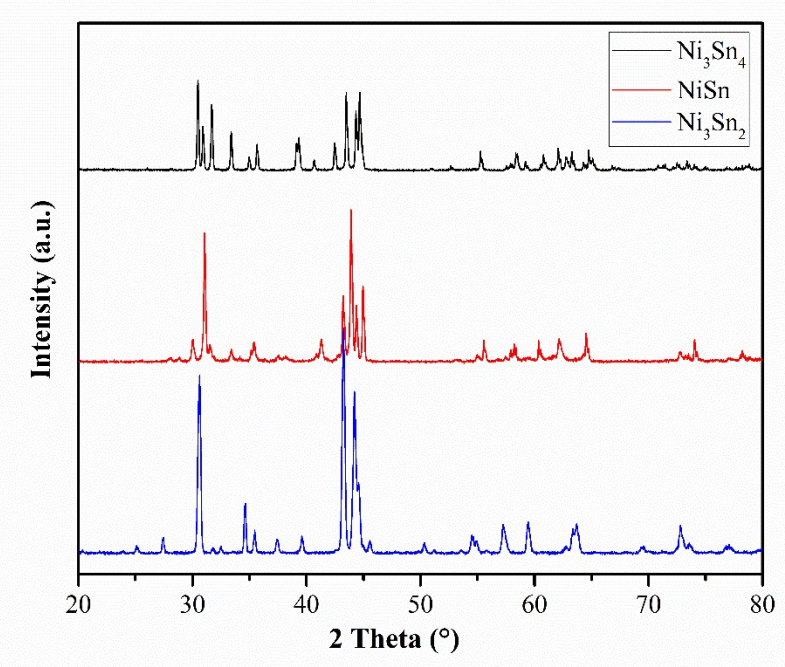

Figure S2. XRD patterns of synthetic SnNi alloys

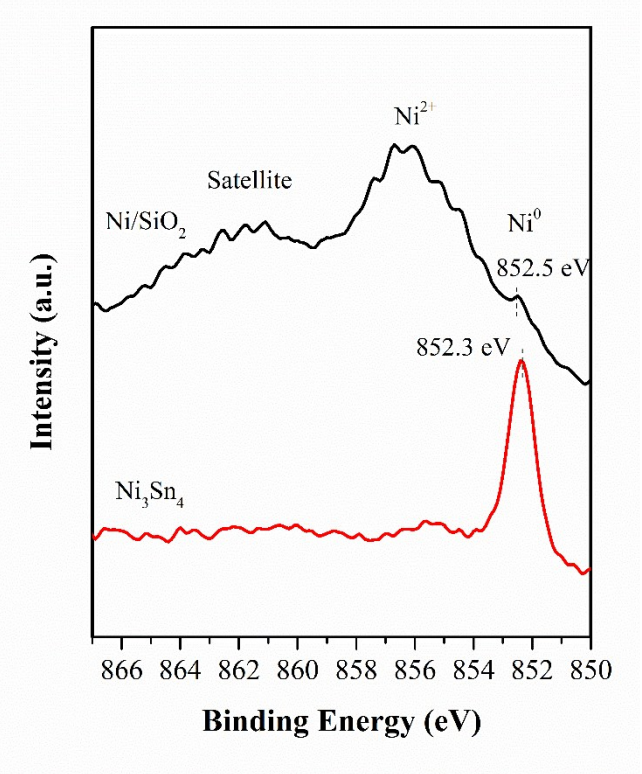

Figure S3. XPS spectra of Ni $2p_{3/2}$ of Ni/SiO_2 and Ni_3Sn_4 alloy.

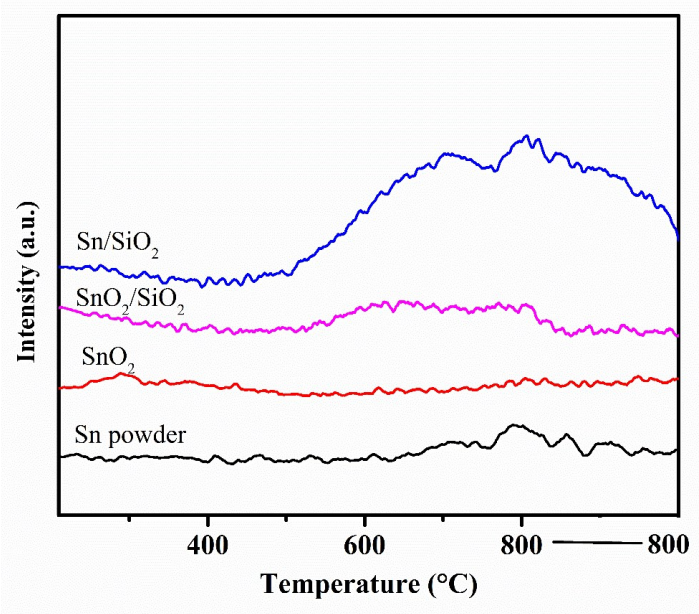

Figure S4. CO_2-TPD profiles for different Sn species.

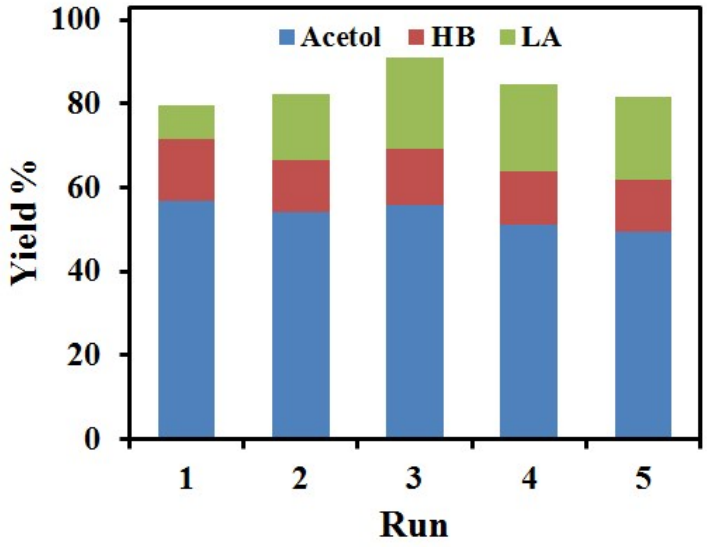

Figure S5. Recycle of 5%Ni-15%Sn/SiO_2 catalyst. Reaction conditions: 50 mg of cellulose, 34 mg of catalyst, 10 mL of H_2O, 230 °C, 4 MPa H_2, 1 h.

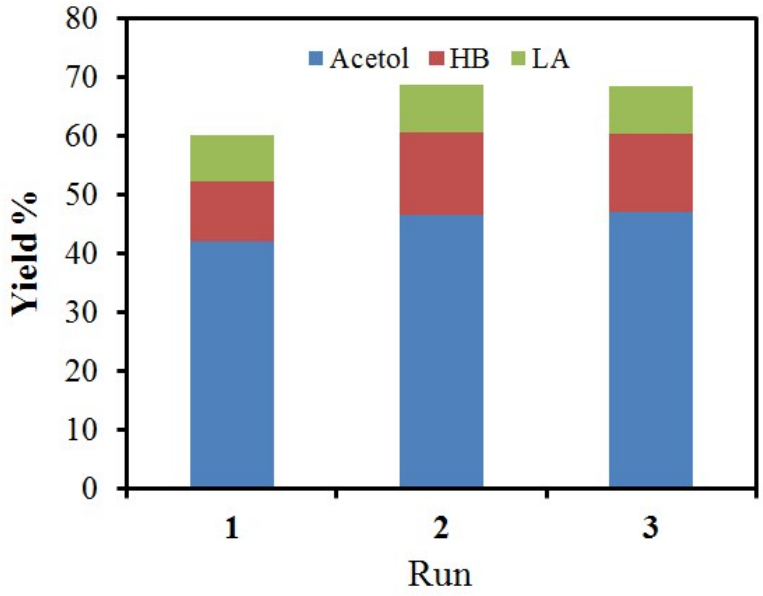

Figure S6. Recycle of Ni_3Sn_4 alloy. Reaction conditions: 50 mg of cellulose, 40 mg of catalyst, 10 mL of H_2O, 230 °C, 4 MPa H_2, 1 h.

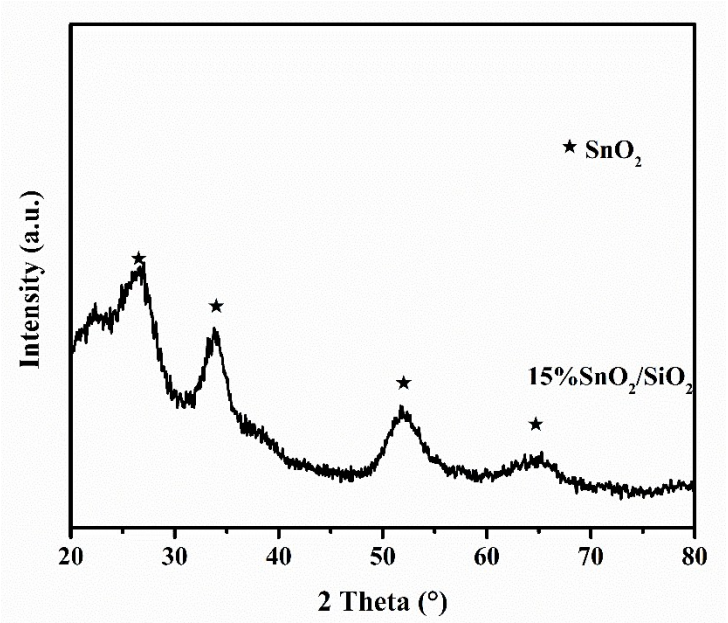

Figure S7. XRD pattern of $15\%SnO_2/SiO_2$.