Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Tuning Decarboxylation Selectivity for Deoxygenation of Vegetable Oil over Pt-Ni Bimetal Catalysts via Surface Engineering

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Catalysts Characterizations

XRD

X-ray diffraction (XRD) was carried out by D/MAX-2500 X-ray diffractometer with Cu-Kα radiation at 40 kV and 140 mA. Samples were measured in the 2θ range from 5 ° to 40 °. The results was shown in Fig S1.

CO pulse Chemisorption

The active metal surface the samples was determined by pulse CO chemisorption employing a Chemisorption Physisorption Analyzer (AMI-300, Altamira Instruments) equipped with a thermal conductivity detector (TCD). Samples were treated in a flow of H2/He at 723 K for 3 h and then evacuated at the same temperature for 1 h before measurements. Pulse carbonic oxide chemisorption was conducted at 308 K. The concentrations of chemisorbed CO were calculated assuming a CO/Pt (Ni) stoichiometry of 1.

Results

XRD characterization

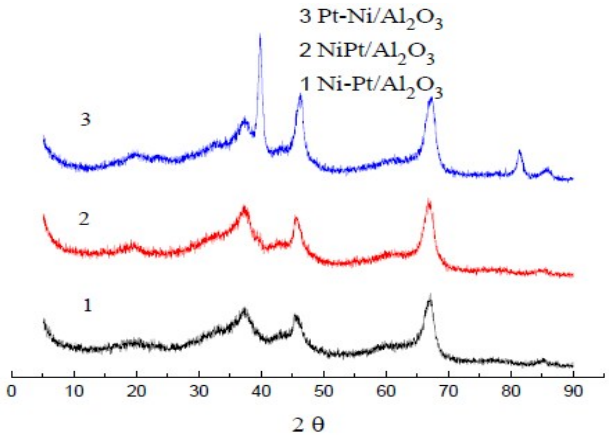

Fig. S1 XRD results of the series NiPt catalysts.

TEM characterization

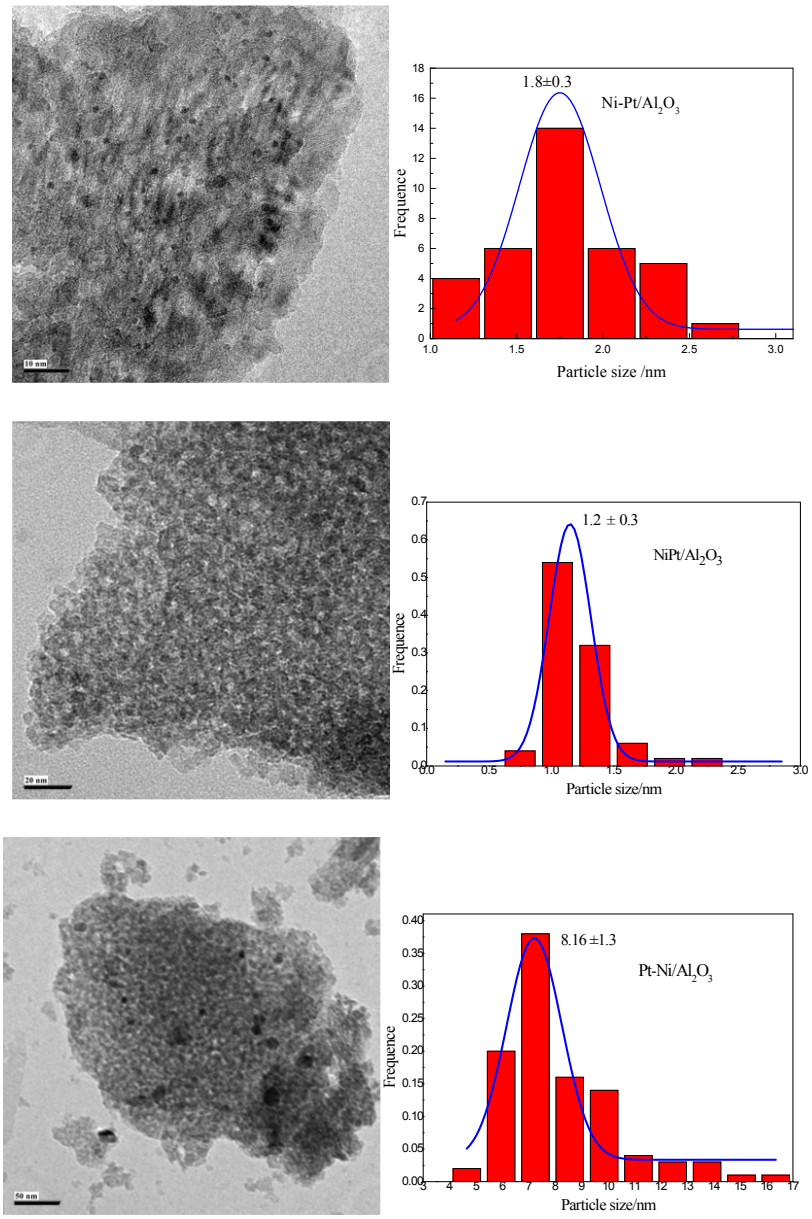

Fig. S2 TEM results of the series NiPt catalysts.

Surface area and dispersion calculation

$$ASA\ (m^2/g) = \frac{L \times f}{d \times \rho}$$

$$dispersion\ (\%) = \frac{ASA \times M}{N \times A \times L}$$

where L is the weight fraction of metal loading, f is the particle shape correction factor (f = 6 for a sphere), d is the average diameter of the supported particles measured by TEM, ρ is the metal density (for Ni/Pt, ρ= 8.90/21.45 g/cm^3), M is the formula weight of the supported metals, N is Avogadro's number, and A is the metal atomic surface area (for Ni/Pt, A = 6.494/8.000 Å^2/atom).

Table S1 Dispersion of the metals active sites

		ASA[a]	dispersion[a] %	CO uptake$_{Pt+Ni}$[b] μmoL/g
Ni-Pt/Al_2O_3	Ni	18.83	0.57	92.2
	Pt	7.81	0.63	
NiPt/Al_2O_3	Ni	28.09	0.84	58.6
	Pt	11.66	0.94	
Pt-Ni/Al_2O_3	Ni	4.13	0.12	72.7
	Pt	1.71	0.14	

ASA, active metal surface area

[a], calculate using the measured size of the Ni and Pt nanoparticles

[b], Estimated from the area under the CO pulse signals.

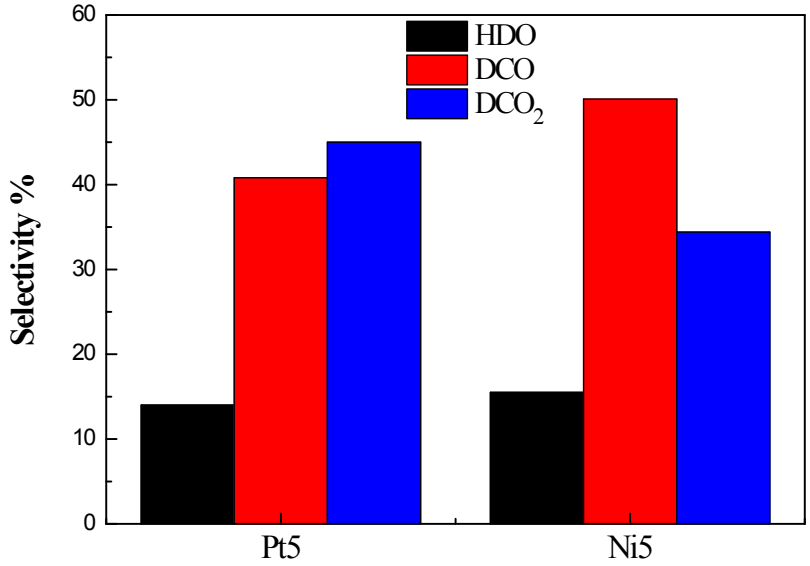

Fig. S3. Deoxygenation results of the 5wt% Ni and 5wt% Pt catalysts.