Supporting Information

Hemoglobin-like NiO Nanostructures as Potential Carriers to Support Noble Metals with Enhanced Catalytic Performances

Guofeng Wang,* Tongyu Zhao, Mingxing Song, Chunxu Wang, Hongbo Liu, and Zhengqun Qin*

College of Information Technology, Jilin Normal University, Siping 136000, People’s Republic of China.
E-mail: jlnuwgf@163.com
Experimental section:

Synthesis of 200 nm Ni$_2$(OH)$_2$CO$_3$ precursor:
0.2 mmol Ni(NO$_3$)$_2$ and 105 mg PVP (k30) are dissolved in 10 mL DMF solution followed by a solvothermal treatment at 190 °C for 24 h. After cooled down to room temperature, the products are collected by centrifugation and washed with water for three times.

Increasing the feeding amount of Ni(NO$_3$)$_2$ can induce the size and shape evolutions of the precursors. For example, addition 0.5 mmol and 1 mmol Ni(NO$_3$)$_2$ at the beginning of the reaction can produce 500 nm hemoglobin-like NiO and 1 um nanosphere, respectively.

Synthesis of NiO nanocrystals:
The well dried Ni$_2$(OH)$_2$CO$_3$ precursors are heated in air at a heating rate of 1 °C/min and maintained at 400 °C for 60 min.

In-situ growth of Pt NPs on the surface of NiO nanocrystals:
50 mg NiO powder is dispersed in 10 mL glycol by ultra-sound treatment. Then 30 mg PVP (k30) and 3 mL K$_2$PtCl$_4$ solution (0.02 mM) are added. The mixture is heated at 50 °C for 30 min followed by a solvothermal treatment at 130 °C for 2 hours.

Catalytic test:
30 mg of catalysts IS put in a stainless steel reaction tube. The experiment was carried out under a flow of reactant gas mixture (1 vol % CO, 99 vol % simulated air) at a rate of 30 mL/min. The composition of the gas was monitored on-line by gas chromatography.
Figure S1. TEM images of sub 1 um Ni$_2$(OH)$_2$CO$_3$ nanospheres.
Figure S2. TEM images of the Ni$_2$(OH)$_2$CO$_3$ precursors obtained at different reaction time: (A): 1 hour; (B): 2 hours; (C): 3 hours; (D): 4 hours.
Figure S3. XRD spectra of 200 nm NiO.
Figure S4. HR-TEM image of 200 nm NiO.
Figure S5. N$_2$-adsorption–desorption isotherms of NiO nanocrystals with different particle sizes (500 nm NiO: red line; 200 nm NiO black line).
Figure S6. EDX spectrum of Pt-200 nm NiO.
Figure S7. XPS spectra of Ni AND Pt in Pt-200 NiO sample.
Figure S8. CO conversion curves of Pt-commercial NiO.