Supplementary Information

Inhibiting CO formation by adjusting surface composition in PtAu alloys for methanol electrooxidation

Min Yin,[a,c] Yunjie Huang,[b] Liang Liang,[b] Jianhui Liao,[b] Changpeng Liu[*b] and Wei Xing[*a]

[a] State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, 5625 Renmin Street, Changchun, China.
[b] Laboratory of Advanced Power Sources, Changchun Institute of Applied Chemistry, 5625 Renmin Street, Changchun, China.
[c] Graduate University of Chinese Academy of Sciences, Beijing, China.

Experimental Methods

Synthesis of PtAu/C materials

PtAu alloys supported on carbon black were prepared by microwave-assisted polyol reduction method. Firstly, Vulcan XC-72 carbon black was ultrasonically suspended in ethylene glycol for 2 h, following by mixing with a certain proportion of H_2PtCl_6 and $HAuCl_4$ solution. The feeding molar ratio of Pt/Au in H_2PtCl_6 and $HAuCl_4$ solution is 1/1, 2/3, 1/2, respectively. Then, 100 s microwave operation was performed after pH was adjusted to 10. At last, the suspension was filtered and washed with the hot triply distilled water until no Cl^- was detected and dried in a vacuum oven overnight. Thermal treatment was performed at 500 □ for 2 h under N_2/H_2 (9:1 in volume) atmosphere only for the sample with 1/1 PtAu composition.

Materials Characterization

X-ray diffraction patterns were obtained using a Rigaku-D/MAX-PC2500 X-ray diffractometer (Japan) with the Cu Kα (λ=1.5405 Å) as a radiation source operating at 40 kV and 200 mA. X-ray photoelectron spectroscopy was recorded on a Kratos XSAM-800 spectrometer with an Al Kα monochromatic source. The surface content ratio of Pt and Au was determined by integrating the surface area under the Pt and Au 4f core-level peaks. The C 1s peak was used as a reference.

Electrochemical measurements

Electrochemical measurements were carried out with a Princeton Applied Research Model 273A Potentiostat/Galvanostat with a Pt coil as the counter electrode and Ag/AgCl as the reference electrode. For the working electrode preparation, a 5 mg of the PtAu/C catalyst was dispersed ultrasonically in 1 ml of ethanol with 50 µl of 5 % Nafion solution. Then, 10 µl of the dispersion was pipetted on a polished glassy carbon electrode. Finally, the electrode was obtained after the solvent volatilized.

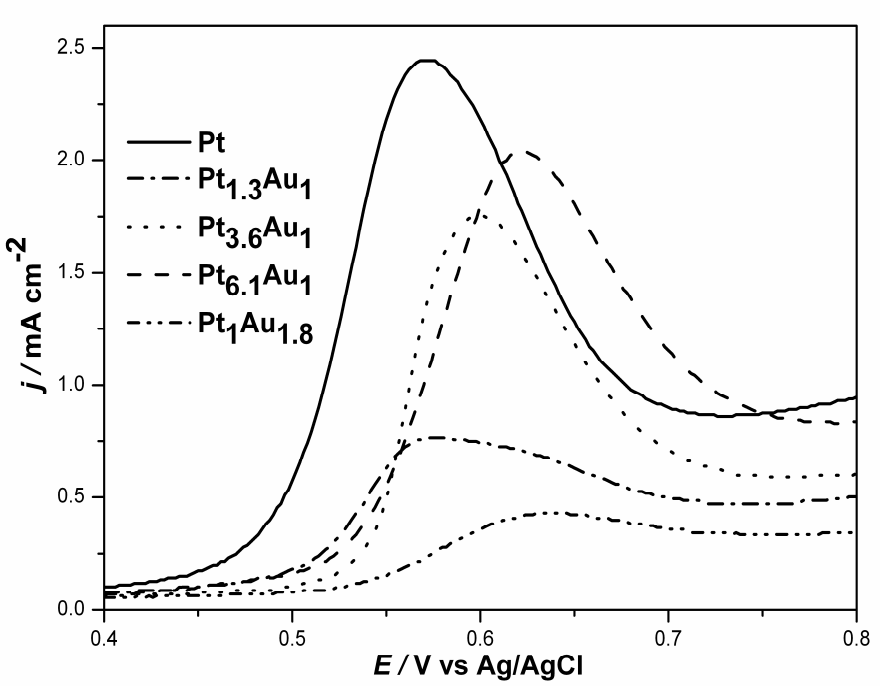

Fig. S1. CO-stripping voltammogram: first cyclic scan (scan rate: 20mV s^{-1}) at the CO-adsorbed PtAu alloy catalysts in 0.5 M H_2SO_4 solutions.

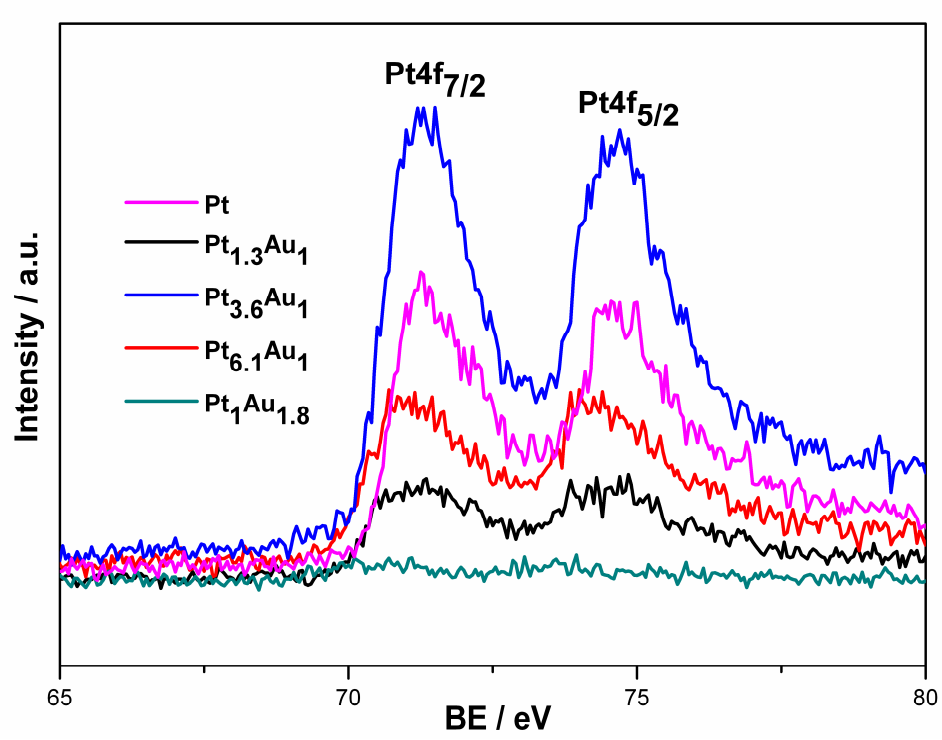

Fig. S2. XPS spectra of Pt 4f regions for PtAu alloy catalysts.