Supplementary Material (ESI) for Journal of Materials Chemistry

Electronic Supplementary Information

An efficient composite hybrid catalyst fashioned from Pt nanoparticles and Sb-doped SnO_2 nanowires for alcohol electro-oxidation

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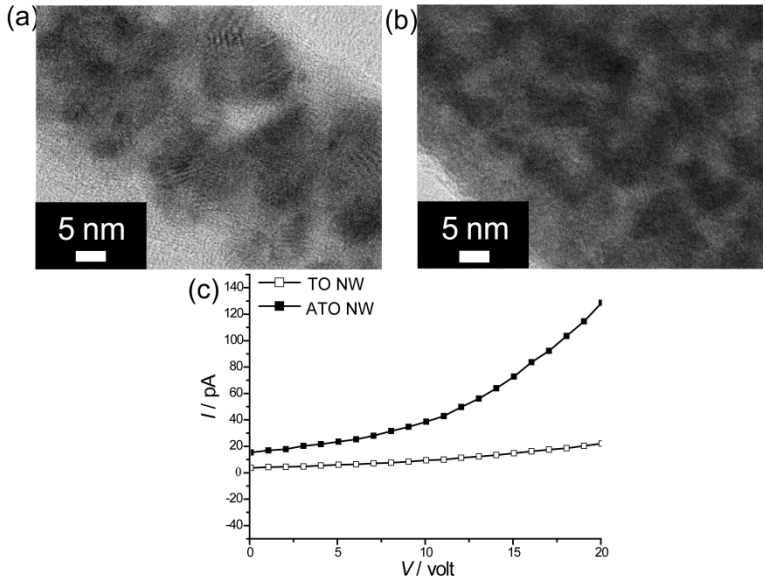

Fig. S1 HRTEM images of (a) TO NW and (b) ATO NW; (c) I-V curves of single TO NW and ATO NW.

To inverstigate elecrical conductivity of nanowires, the TO NW and ATO NW were dispersed individually in isopropyl alcohol by sonication and then dropped on a silicon wafer with a SiO_2 thickness of 100 nm. The silicon wafer is made from a highly doped p-type silicon, which can be used as a back gate electrode. Additionally, metal electrodes consisting of Ti (30 nm)/Au (50 nm) were deposited by an electron beam evaporator and defined as source and drain electrodes. The electronic properties of the NWs were measured using a semiconductor parameter analyzer (Agilent B-1500) at room temperature.

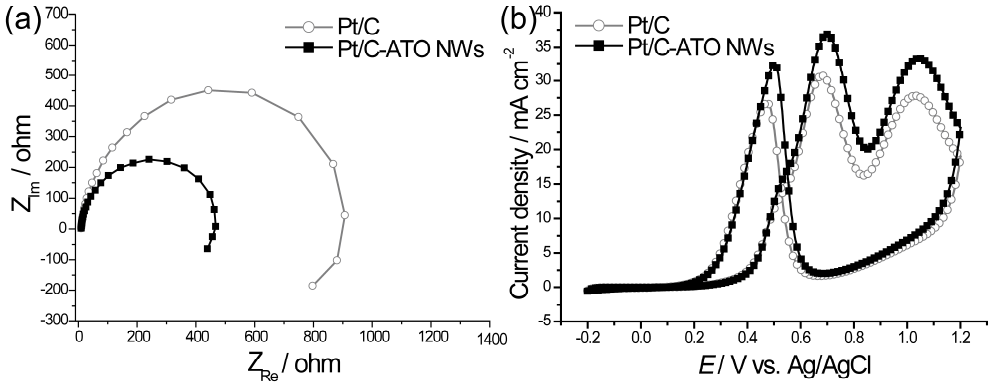

Fig. S2 (a) Nyquist plots (constant voltage = 0.4 V versus Ag/AgCl) and (b) cyclic voltammetry (scan rate = 50 mV/s) of Pt/C alone and Pt/C-ATO NWs in a 2 M ethanol + 0.5 M H_2SO_4 solution.

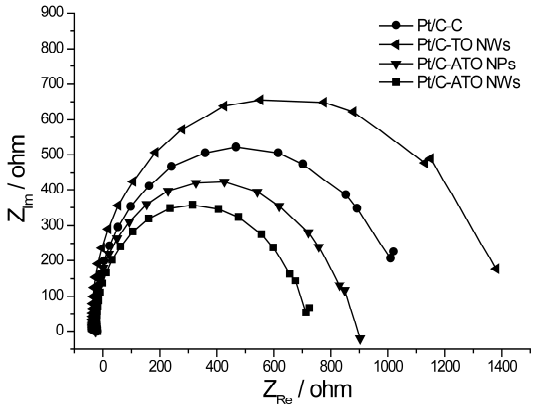

Fig. S3 Nyquist plots of other hybrid catalysts in a 1 M ethanol + 1 M KOH solution (constant voltage = –0.3 V versus SCE).

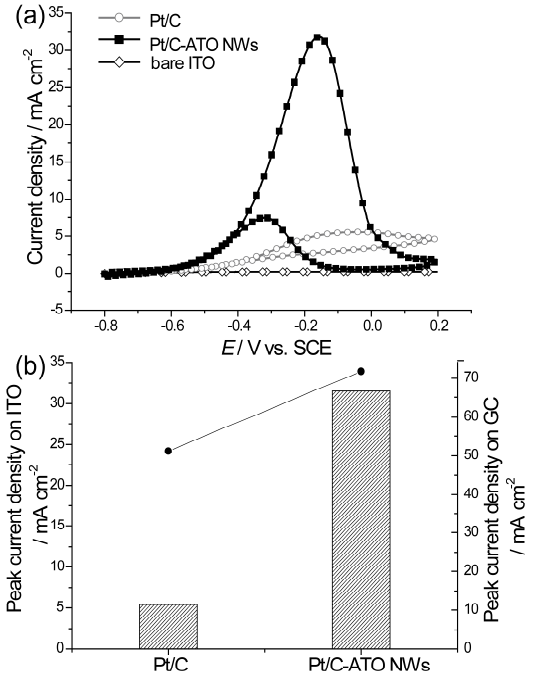

Fig. S4 (a) Cyclic voltammograms and (b) peak current densities for Pt/C alone and Pt/C-ATO NWs on ITO working electrodes at 15 mΩ (columns) in a 1 M ethanol + 1 M KOH solution (scan rate = 50 mV/s). The dotted lines in b represent the peak current densities on a glassy carbon working electrode with 2 mΩ.

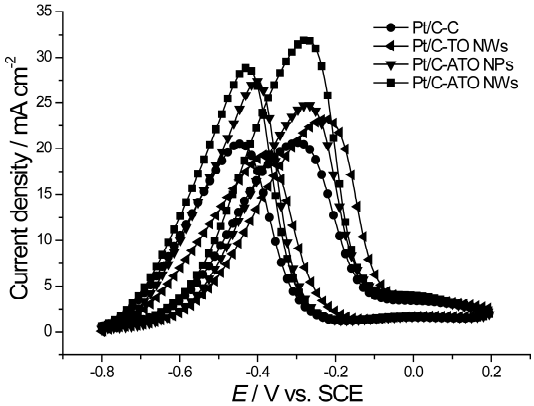

Fig. S5 Cyclic voltammograms of other hybrid catalysts in a 1 M ethanol + 1 M KOH solution (scan rate = 50 mV/s).

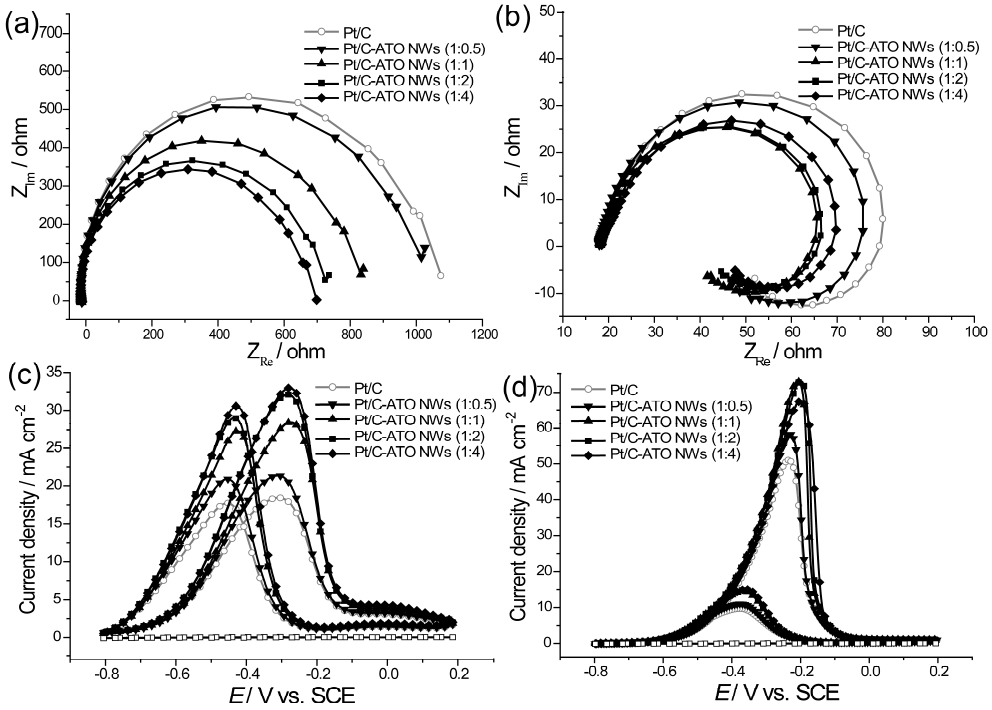

Fig. S6 Nyquist plots of Pt/C alone and hybrid Pt/C-ATO NWs catalysts with variable composite ratios in (a) 1 M ethanol + 1 M KOH and (b) 1 M methanol + 1 M KOH solutions (constant voltage = –0.3 V versus SCE). Cyclic voltammograms of Pt/C, ATO NWs and hybrid Pt/C-ATO NWs catalysts with variable composite ratios in (c) 1 M ethanol + 1 M KOH and (d) 1 M methanol + 1 M KOH solutions (scan rate = 50 mV/s).

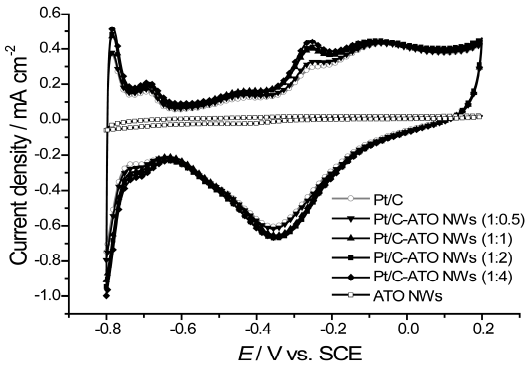

Fig. S7 Cyclic voltammograms of Pt/C alone, ATO NWs and Pt/C-ATO NWs catalysts with variable composite ratios in a 1 M KOH solution (scan rate = 50 mV/s).

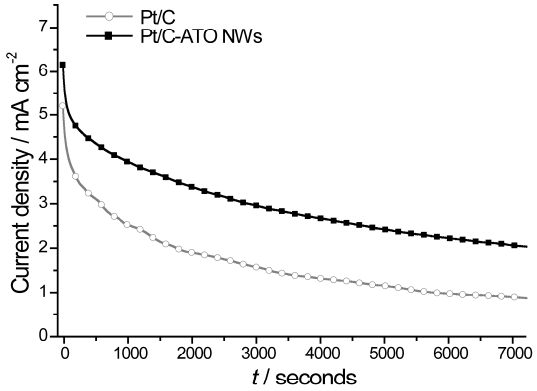

Fig. S8 Original chronoamperometric curves of Pt/C alone and Pt/C-ATO NWs in a 1 M methanol + 1 M KOH solution for 7200 seconds (constant voltage = –0.3 V versus SCE).

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