Electronic Supplementary Information

# Fine silver sulfide-platinum nanocomposites supported on carbon substrates for methanol oxidation reaction

Jiayi Tang,[a,b] Dong Chen,[a] Chengyin Li,[a] Xianfeng Yang,[c] Hui Liu[a,d,*] and Jun Yang[a,b,d,*]

[a] *State Key Laboratory of Multiphase Complex Systems, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China 100190. Tel: 86-10-8254 4917; Fax: 86-10-8254 4915; E-mail: liuhui@ipe.ac.cn (H.L.); Tel: 86-10-8254 4915; Fax: 86-10-8254 4915; jyang@ipe.ac.cn (J. Y.)*

[b] *University of Chinese Academy of Sciences, No. 19A Yuquan Road, Beijing 100049, China*

[c] *Analytical and Testing Centre, South China University of Technology, Guangzhou 510640, China*

[d] *Center for Mesoscience, Institute of Process Engineering, Chinese Academy of Sciences, Beijing 100190, China*

Financial supports from the National Natural Science Foundation of China (Grant No.: 21376247, 21506225, 21573240), Center for Mesoscience, Institute of Process Engineering, Chinese Academy of Sciences (COM2015A001), New Faculty Start-up funding in South China University of Technology, and The Fundamental Research Funds for the Central Universities are gratefully acknowledged.

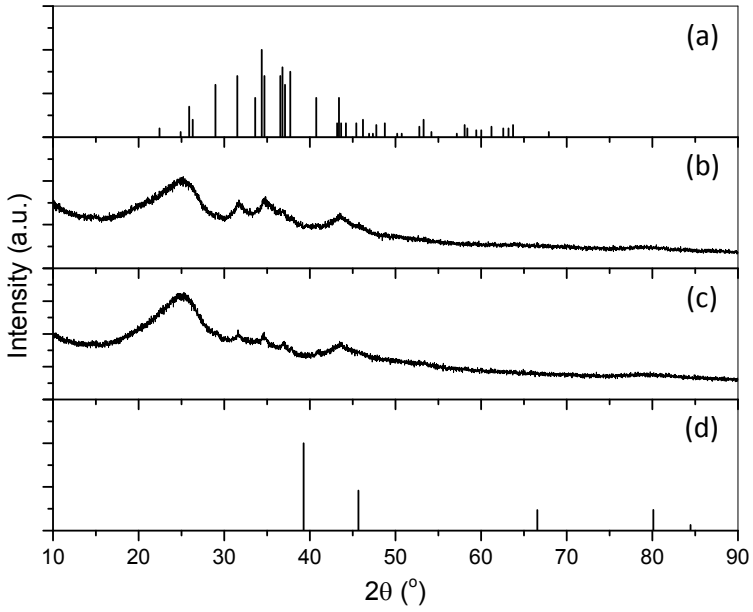


**Fig. S1** XRD patterns of $Ag_2S$ reference with JCPDS Card No. of 140072 (a), carbon-supported $Ag_2S$ nanocrystals (b), carbon-supported $Ag_2S$-Pt nanocomposites (c), and Pt reference with JCPDS Card No. of 882343, respectively.

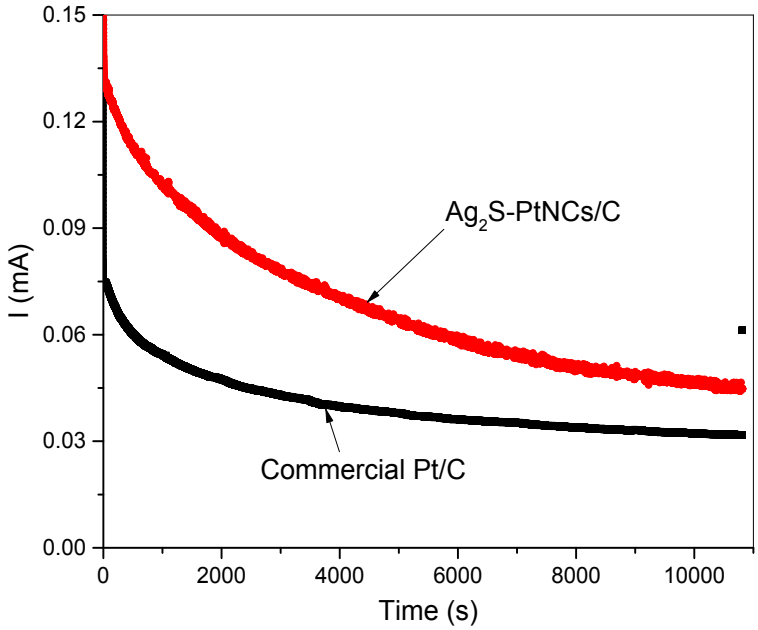


**Fig. S2** Chronoamperograms of the $Ag_2S$-PtNCs/C and commercial Pt/C catalysts at 0.45 V vs Ag/AgCl in argon-purged $HClO_4$ (0.1 M) with 1 M methanol.

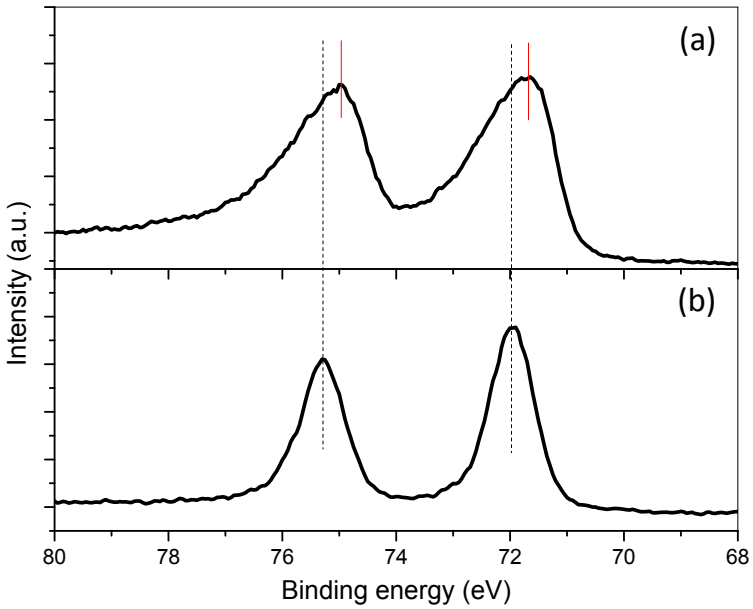


**Fig. S3** 4f XPS spectra of Pt in $Ag_2S$-PtNCs/C (a), and commercial Pt/C catalysts (b), in which the slight shift to lower value indicates the electronic coupling effect between the $Ag_2S$ and Pt domains in the composite materials.

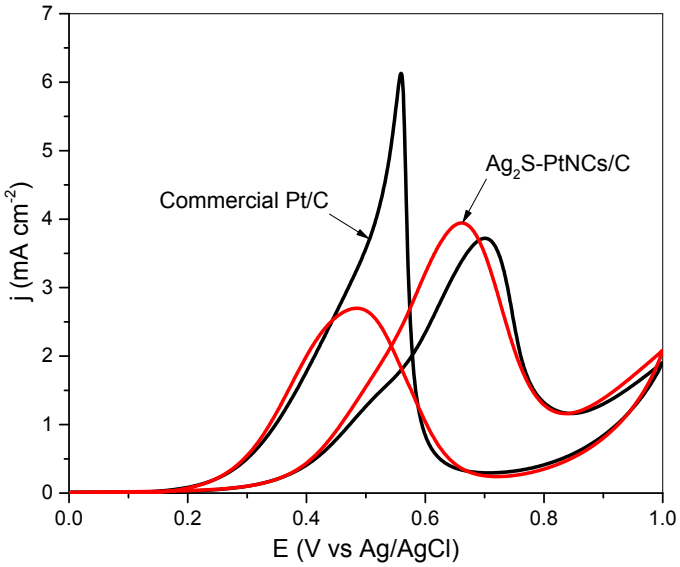


**Fig. S4** cyclic voltammograms of $Ag_2S$-PtNCs/C and commercial Pt/C catalysts in argon-purged $HClO_4$ (0.1 M) with methanol (1 M) at a scan rate of 20 mV $s^{-1}$ (b). The current densities were normalized by the geometric area (0.196 $cm^2$) of the glassy carbon electrode.