Supporting Information

Fabrication of In_2O_3/In_2S_3/Ag nanocubes for efficient photoelectrochemical water splitting

Rui Xu[1,‡], Haohua Li[1,‡], Wenwen Zhang[1], Zepeng Yang[1], Guiwu Liu[1,*], Ziwei Xu[1], Haicheng Shao[1] and Guanjun Qiao[1,2,*]

[1] School of Materials Science and Engineering, Jiangsu University, Zhenjiang 212013, China

[2] State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an 710049, China

‡ These authors contribute equally to this work.

Corresponding author: gwliu76@ujs.edu.cn (Guiwu Liu), gjqiao@ ujs.edu.cn (Guanjun Qiao)

It could be concluded that the XRD results indicate that the In_2O_3 and In_2O_3/In_2S_3 nanocubes are successfully synthesized. However, the patterns of the Ag nanopaticles are not detected due to the small mass loading and uniform distribution, which could be investigated by EDS (Fig. S1).The EDS measurement was carried out at the In_2O_3/Ag(Fig. S1a) and In_2O_3/In_2S_3/Ag (Fig. S1b) heterostructured nanocubes. Apart from the carbon and copper peaks, sulfur, oxygen and indium signals can be observed. Ag peaks can also be observed in both Fig.S1a(In_2O_3/Ag) and Fig. S1b (In_2O_3/In_2S_3/Ag). In the Fig. S1b，the as-synthesized products In_2O_3/In_2S_3/Ag were grown on the FTO substrates and these substances are very few. Therefore, the ratio in In_2O_3/In_2S_3 was carried out by EDS analysis. In the analysis of the EDS diagram (Fig. S1b), we concluded that the weight percent ratio of O:S is 30.80At%:12.20At%. And the stoichiometric ratio is approximately 2.5:1. It could be concluded that the In_2O_3/Ag and In_2O_3/In_2S_3/Ag nanocubes are successfully grown on the FTO substrates.

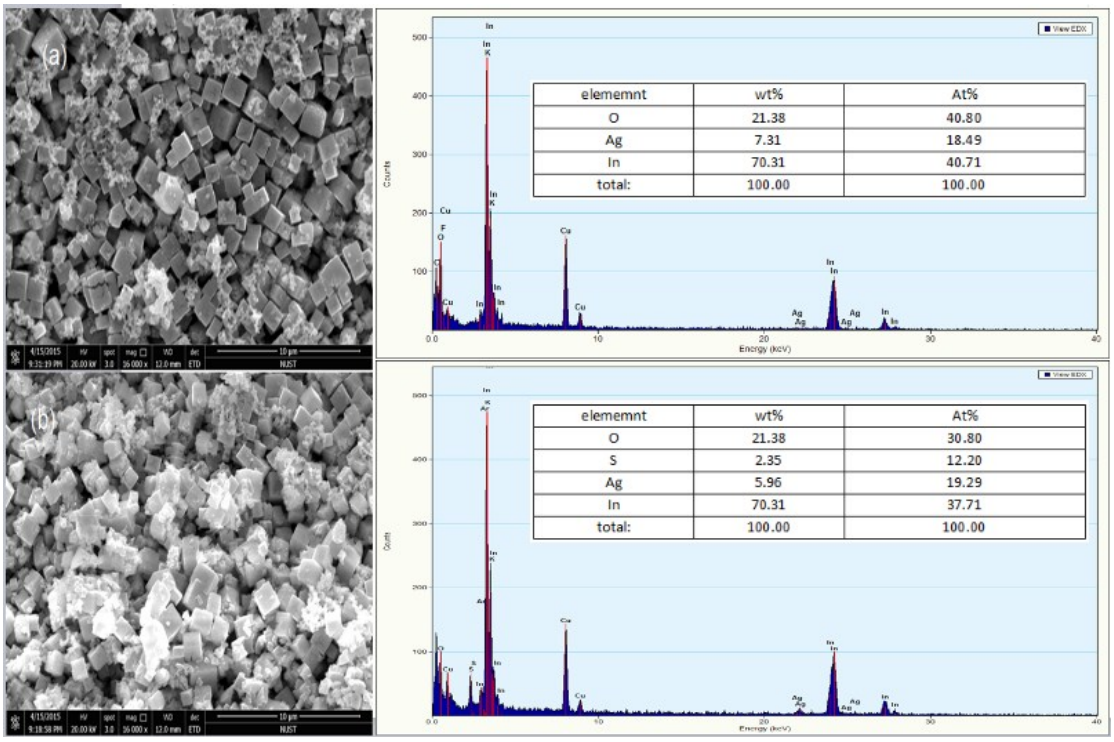

Fig. **S1**. SEM and EDS results for (a) In_2O_3/Ag and (b) In_2O_3/In_2S_3/Ag nanocubes.

The direct optical bandgap (*Eg*) of the semiconductor nanomaterial can be

calculated from the equation ($(\alpha hv)^2 = A(hv—Eg)$), where hv is the absorption coefficient, and A is a constant for the material[1]. As shown in Fig. S2, the calculated direct Eg value for four samples is about 2.87 eV for In_2O_3, 2.71 eV for In_2O_3/Ag, 2.30 eV for In_2O_3/In_2S_3 and 2.25 eV for In_2O_3/In_2S_3/Ag nanocubes.

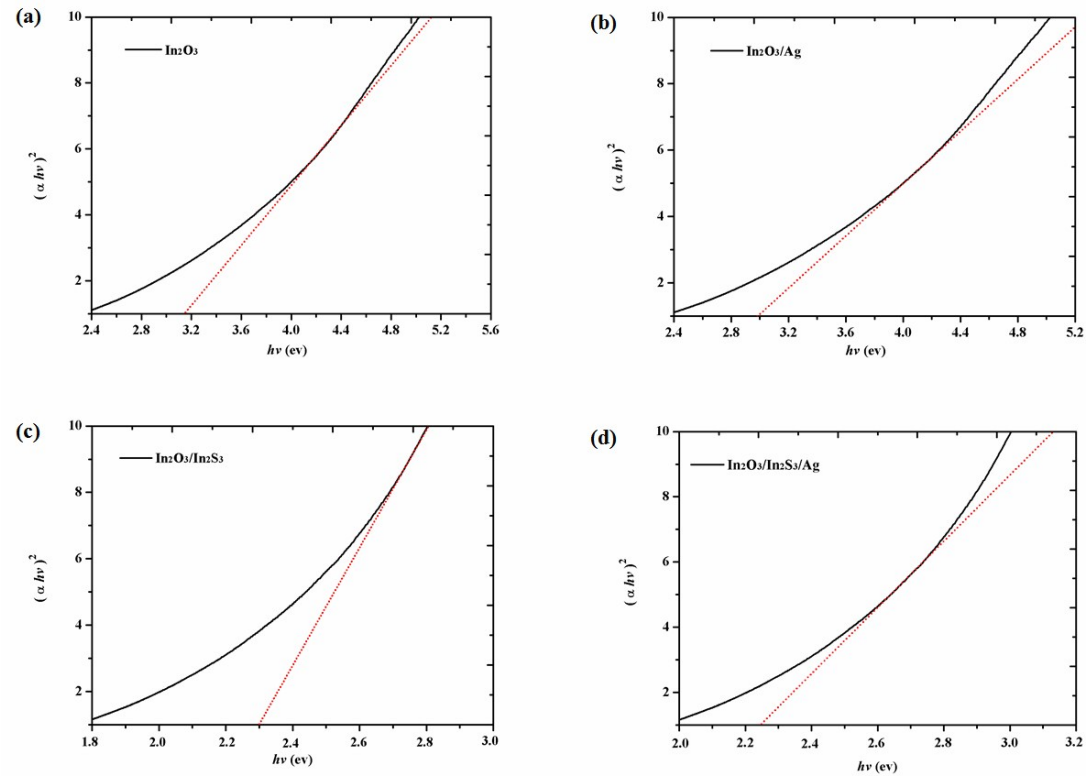

Fig. **S2**.$(\alpha hv)^2$ vs hv curves for the In_2O_3, In_2O_3/Ag, In_2O_3/In_2S_3 and In_2O_3/In_2S_3/Ag nanocubes

Reference

[1] J.Y. Gan, X.H. Lu, T. Zhai, Y.F. Zhao, S.L. Xie, Y.C. Mao, Y.L. Zhang, Y.Y. Yang and Y.X. Tong, *J. Mater. Chem*., 2011, **21**, 14685.