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Facile Synthesis of Urchin-like Sb_2S_3 Nanostructure with High Photocatalytic Activities

Jing Zhou*, Jiangchun Chen, Mengyao Tang Yanqun Liu Xiaoyu Liu and Hua Wang *

College of Chemistry Engineering, Northeast Dianli University, Jilin 132012, P. R.China. E-mail: zhoujing@mail.nedu.edu.cn
School of Chemistry, Beihang University, Beijing 100191, P. R. China. E-mail: wanghua8651@buaa.edu.cn

Experimental part

Material synthesis: All reactants and solvents are in analytical grade and were used without further purification. In a typical synthesis, 1 mM potassium antimony tartrateand and 2 mM thioacetamide were dissolved in 30 mL ethylene glycol. The solution was stirred strongly for about 30 min. And the whole solution was refluxed at 160 °C for 5 h. Finally, the dark-brown precipitate was centrifuged, washed with distilled water and absolute alcohol several times, and then dried at 60 °C for 3 h.

Characterization: The morphology and size of the as-synthesized product was observed directly by scanning electron microscopy (SEM, Quanta 250 FEG) with energy-dispersive X-ray spectroscopy (EDS). Transmission electron microscopy (TEM) and selected area electron diffraction (SAED) studies were performed using JEOL JEM-2100F electron microscopes. The phase composition of the as-prepared product was determined using a Rigaku Dmax 7000 X-ray diffraction (XRD), equipped with Cu K radiation of 1.5406 Å. The patterns were recorded at a scanning rate of $6°min^{-1}$ from 10°up to 80°(2θ). Raman spectroscopy measurements were performed on LabRAM HR800 system. The UV-vis diffusive reflectance spectrum was performed in a UV-3600 spectrophotometer at room temperature using barium sulfate as the reference.

Photocatalysis experiment: The photocatalytic activity of the Sb_2S_3-based photocatalyst was investigated by degradation of MB dye under a 300 W Xe

lamp with UV cutoff filter (providing visible light with λ ≥400 nm). The photodegradation experiments were carried out at 25 °C in a cylindrical quartz vessel (200 mL) containing the Sb_2S_3-based photocatalyst (0.05 g) and MB solution (100 ml, 10, 20, 30, 40, 50, 60, 70 mgL^{-1}). Before exposure to the light, the solution with catalyst was stirred in the dark for 30 min to ensure an adsorption/desorption equilibrium between the Sb_2S_3 nanostructure and organic dye molecules.

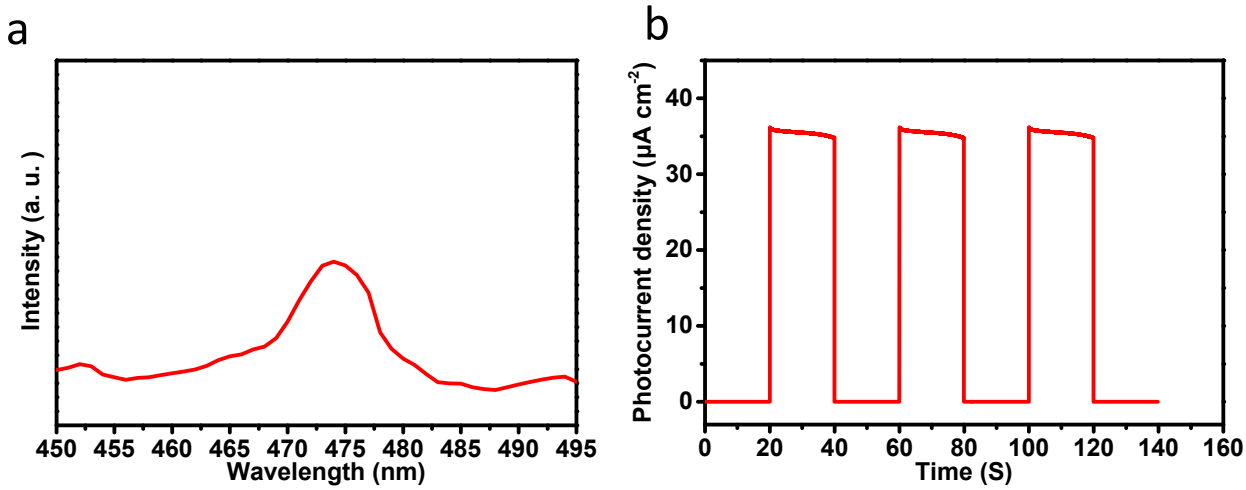

Figure S1. Photoluminescence emission (a) and photocurrent spectra (b) of as-prepared Sb_2S_3

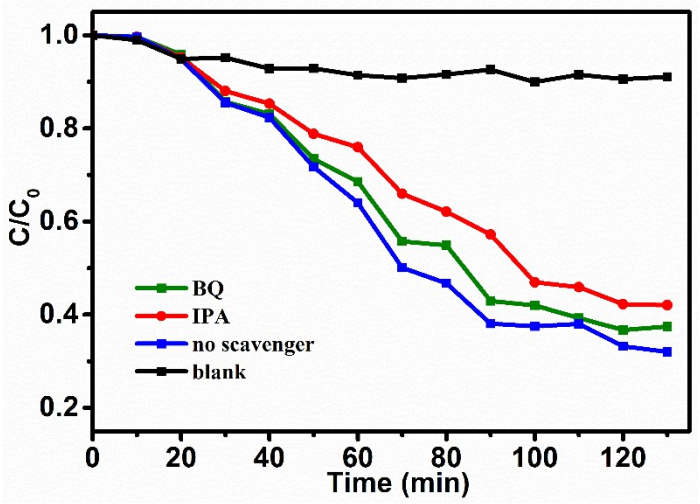

Figure S2. Photodegradation curve of MB dye without Sb_2S_3 and Photodegradation curves of MB dye with added different scavengers over as-prepared Sb_2S_3.