

Low-cost solution-processed digenite Cu_9S_5 counter electrode for dye-sensitized solar cells

Maowei Hu^a, Ze Yu^{*a}, JiaJia Li^a, Xiaoqing Jiang^a, Jianbo Lai^a, Xichuan Yang^a, Mei Wang^{*a} and Licheng Sun^{a,b}

^aState Key Laboratory of Fine Chemicals, Institute of Artificial Photosynthesis, DUT-KTH Joint Education and Research Center on Molecular Devices, Dalian University of Technology (DUT), Dalian 116024, China. Email: ze.yu@dlut.edu.cn. Email: symbueno@dlut.edu.cn.

^bDepartment of Chemistry, School of Chemical Science and Engineering, KTH Royal Institute of Technology, 100 44 Stockholm, Sweden.

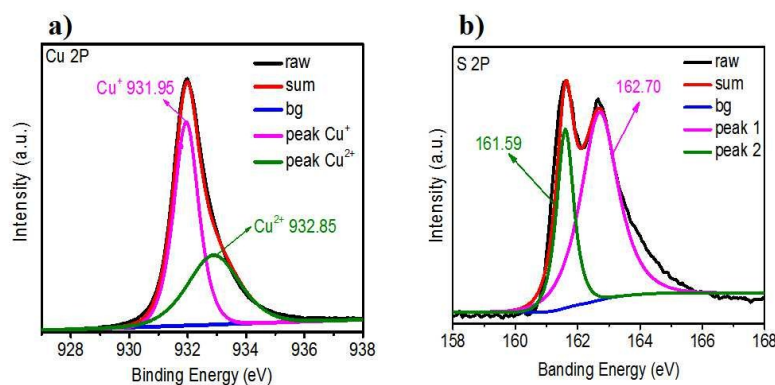


Fig. S1. (a) and (b) The Cu 2p and S 2p XPS spectrum of Cu_9S_5 film on FTO substrate.

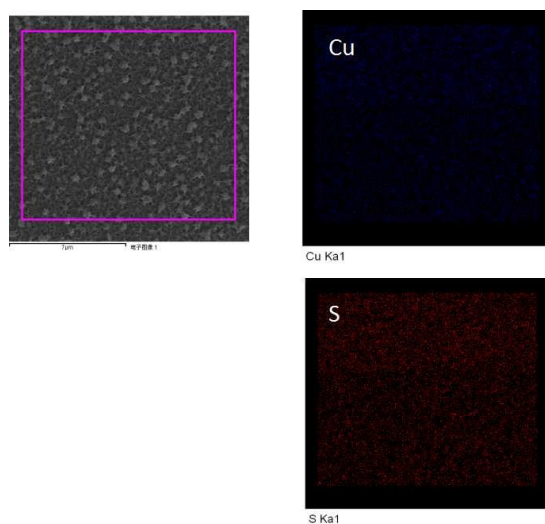


Fig. S2. EDS elemental mappings of Cu_9S_5 film on FTO substrate.

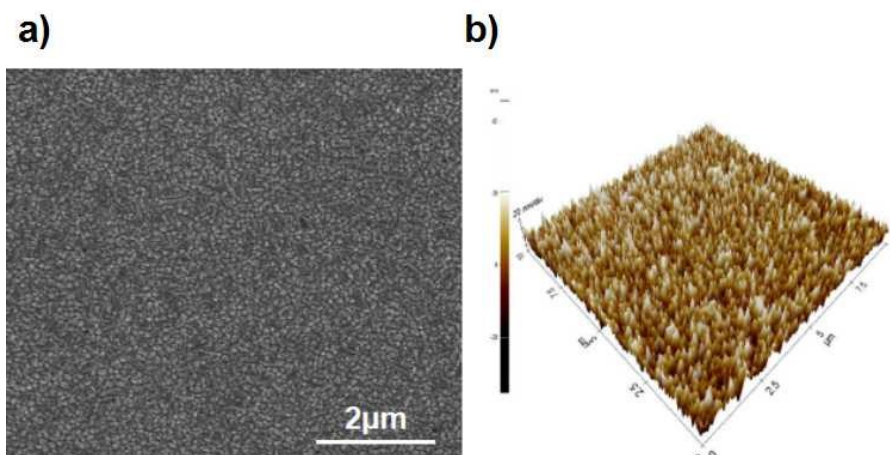


Fig. S3. (a) FE-SEM image of Pt CE on FTO substrate; (b) AFM image of Pt CE on FTO substrate.

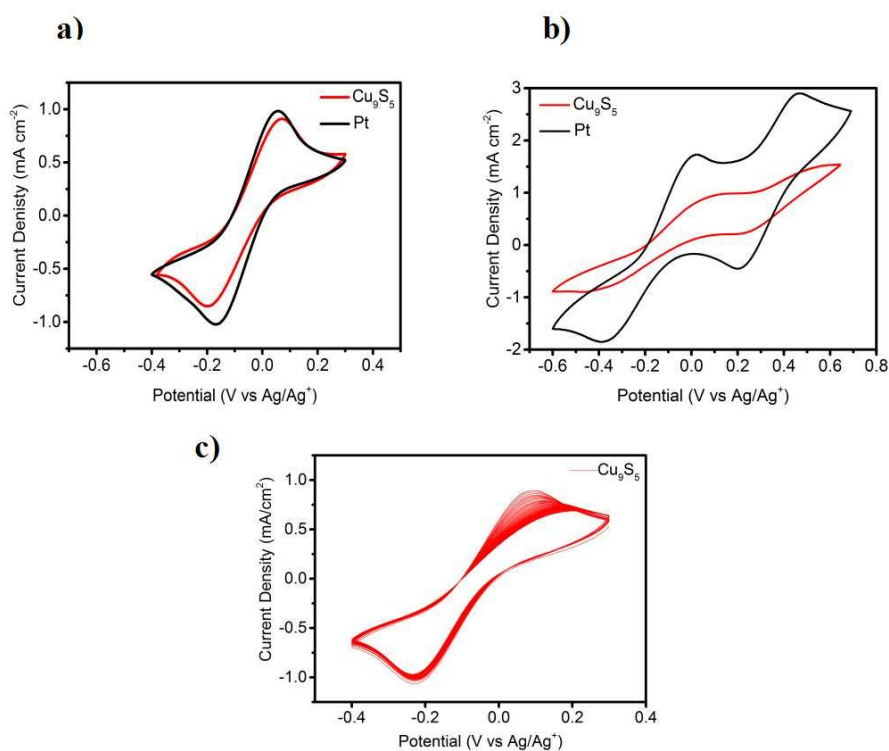


Fig. S4. Cyclic voltammograms for Cu_9S_5 electrode (red line), Pt electrode (black line). (a) cobalt complex-based electrolyte in acetonitrile solution of 20 mM $\text{Co}(\text{bpy})_3(\text{PF}_6)_2$, 5 mM $\text{Co}(\text{bpy})_3(\text{PF}_6)_3$, and 100 mM LiClO_4 ; (b) iodine-based electrolyte in acetonitrile solution of 10 mM LiI , 1 mM I_2 , and 100 mM LiClO_4 ; (c) 50 cycles of CV for as-prepared Cu_9S_5 electrode. The counter electrode was a Pt wire and the reference electrode was Ag/AgNO_3 . The scan rate was 50 mV s^{-1} .

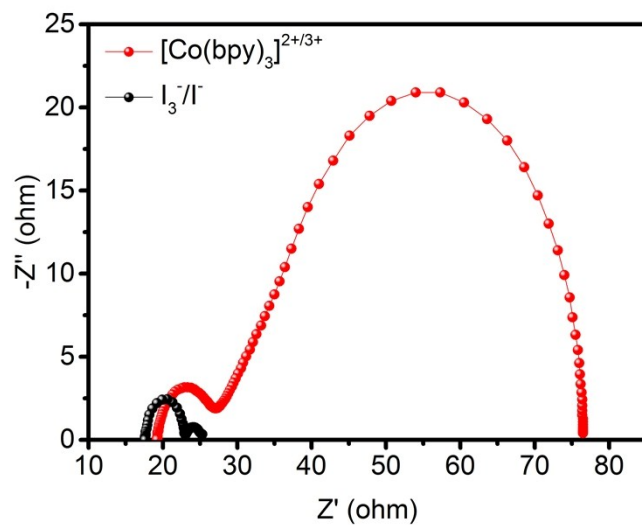


Fig. S5. Nyquist plots of the prepared Pt CEs in a symmetric sandwich cell configuration with $[\text{Co}(\text{bpy})_3]^{2+/3+}$ and I^-/I_3^- based electrolytes.

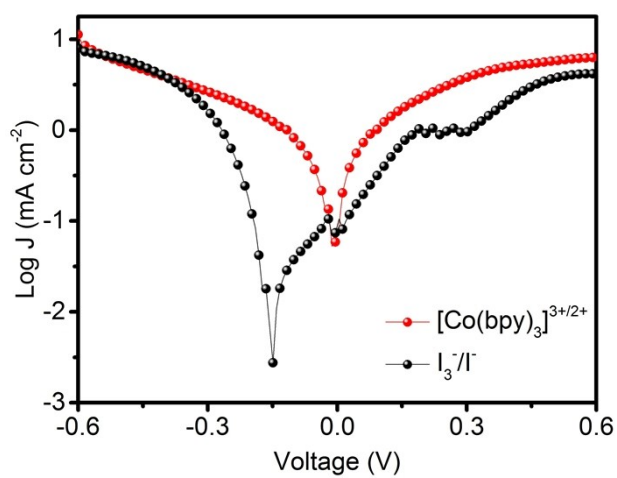


Fig. S6. Tafel-polarization curves of the prepared Cu_9S_5 electrode in a dummy cell with $[\text{Co}(\text{bpy})_3]^{2+/3+}$ and I^-/I_3^- based electrolytes

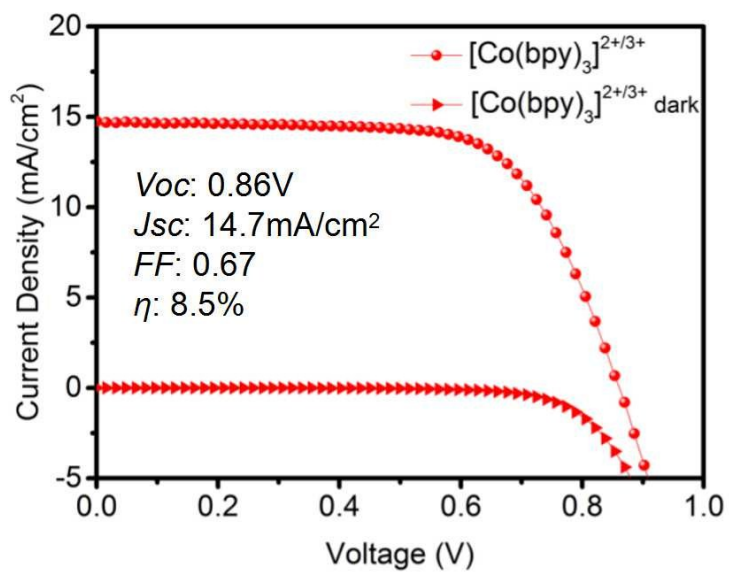


Fig. S7. Photocurrent density-voltage (J - V) curves of DSSCs Pt electrode with $[\text{Co}(\text{bpy})_3]^{2+/3+}$ and I^-/I_3^- based electrolytes measured under AM 1.5G simulated sunlight (100 mW cm^{-2}) and in the dark.