Supporting Information

Improving TiO_2 photoanode through silver-polyoxotungstate nanohybrids: Toward photovoltaic and photoelectrocatalytic application

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Materials

Preparation of $K_6P_2W_{18}O_{62}$: $Na_2WO_4 \cdot 2H_2O$ (100g) was added to 350ml of water, and the solution was heated to boiling. Then 150ml of 85% H_3PO_4 was solwly added to the boiling solution, and the resulting yellow-green solution was refluxed for 5-13h. The solution was cooled, and the product was precipitated by addition of 100g of solid KCl. The light green precipitate was collected, redissolved in a minimum amount of hot water, and allowed to crystallize at 5℃ overnight. Cyclic voltammertry and UV-vis adsorption spectra were used to identify the product, which were shown in Fig. S1 and Fig. S2.

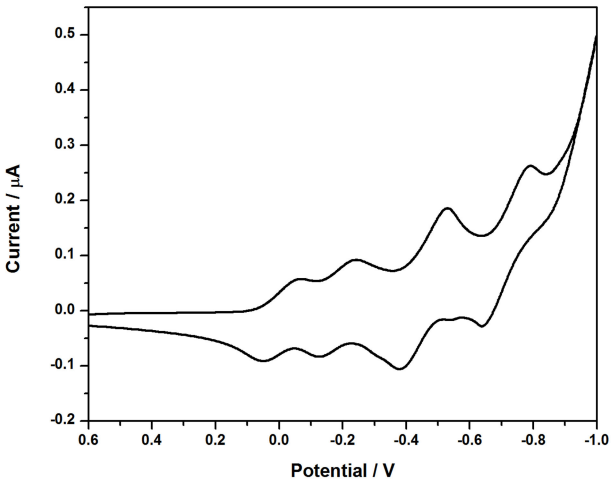

Fig. S1 Cyclic voltammograms of $K_2P_2W_{18}O_{62}$ using the ITO as a working electrode, the Ag/AgCl electrode as a reference electrode, a platinum foil as the counter electrode in HNO_3 (pH 1.5) electrolyte.

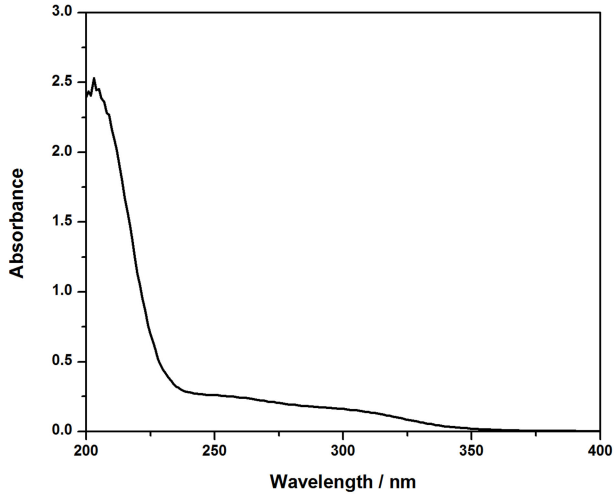

Fig. S2 UV-vis aborption spectra of $K_2P_2W_{18}O_{62}$.

Preparation of TiO_2: TiO_2 colloid solutions were prepared by hydrolysis of titanium isopropoxide, $Ti(OCH(CH_3)_2)_4$, as follows: 25ml $Ti(OCH(CH_3)_2)_4$ was added to dropping funnel containing 0.4ml of 2-propanol. The mixture was added slowly to 15ml deionized water, stirring vigorously. During the hydrolysis, 0.1ml of 70% HNO_3 was added. The mixture was then stirred for 8h at ~80℃. As shown in Fig. S3 and Fig. S4, they were edscribed by X-ray diffraction (XRD) analysis and Transmission electron microscopy (TEM) image. The TEM image exhibited that the mean size of the particles were ca. 8 nm.

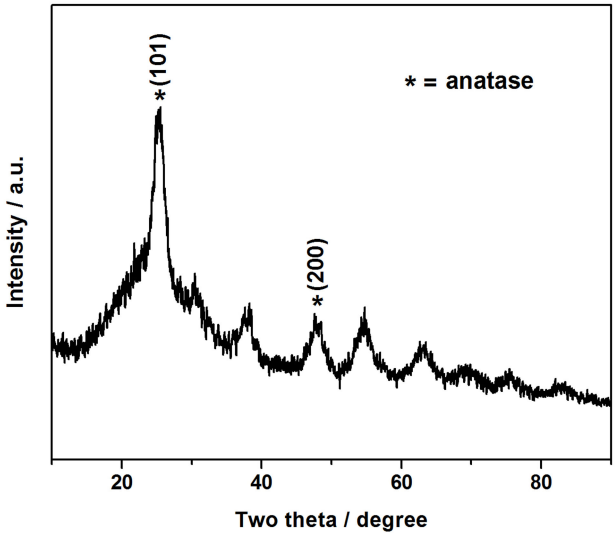

Fig. S3. XRD pattern of TiO_2 colloids.

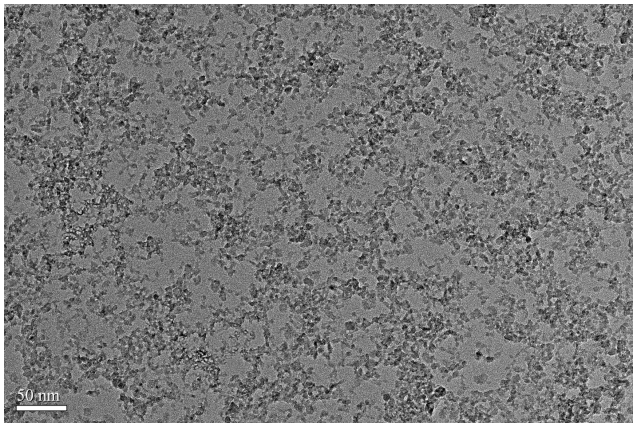

Fig. S4. TEM image of TiO_2 colloids.

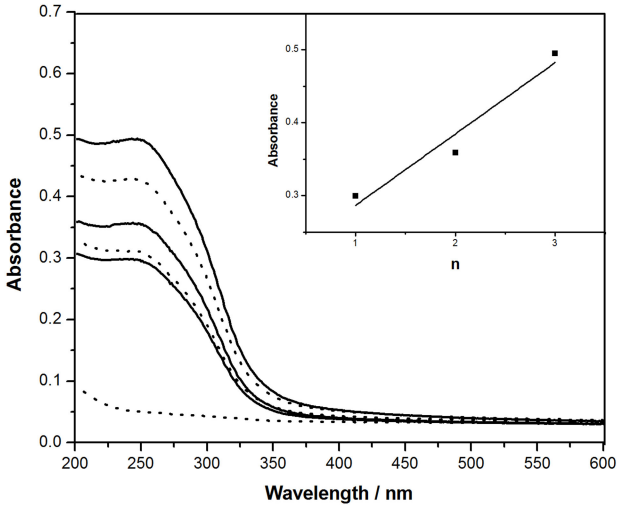

Fig. S5. UV-vis absorption spectra of multilayer films $(Ag\text{-}POT/TiO_2)_n$ on quartz substrates with n=1-3. The dashed line represents spectra after Ag-POT deposition, the solid line represents spectra after TiO_2 deposition. (Inset) relationship of absorbance at 248nm after TiO_2 deposition vs. the number of layers

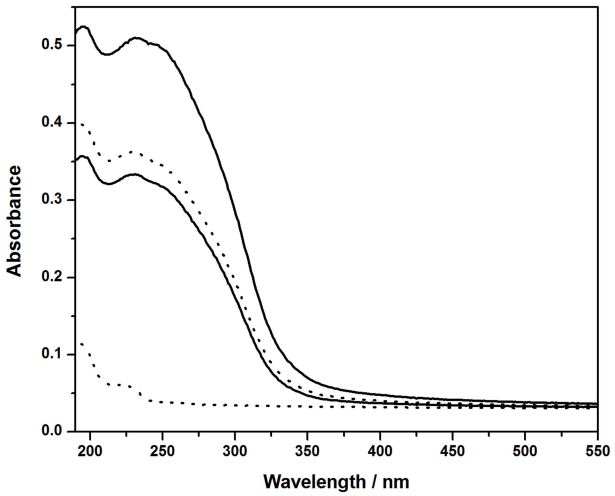

Fig. S5. UV–Vis absorption spectra of multilayer films $(PSS/TiO_2)_2$ on quartz substrates (from lower to upper curves). The dashed line represents spectra after PSS deposition, the solid line represents spectra after TiO_2 deposition

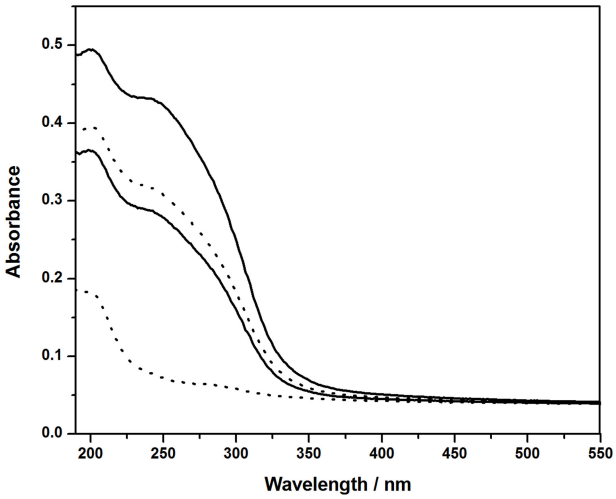

Fig. S6. UV–Vis absorption spectra of multilayer films $(POT/TiO_2)_2$ on quartz substrates (from lower to upper curves). The dashed line represents spectra after POT deposition, the solid line represents spectra after TiO_2 deposition