materials

MDPI

Supporting information

Study of the Functionalities of a Biochar Electrode Combined with a Photoelectrochemical Cell

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Construction of the photoanode electrode

An FTO glass was cut in the required dimensions. It was then cleaned thoroughly with soap. Further cleaning was achieved by sonicating the glass in acetone, ethanol and water. A TiO_2 precursor solution was prepared by mixing 3.5 g of Triton X-100, 19 mL of ethanol, 3.4 mL of glacial acetic acid and 1.8 mL of titanium isopropoxide. A layer of titania was deposited by dipping the clean FTO in the precursor solution. The deposition was limited within the required electrode surface with the help of tapes to avoid coating the back of the FTO glass. After removing the tapes, the electrodes were air dried before calcinating at 550°C. The same procedure was repeated for a second time to ensure a uniform layer. Then, a mesoporous titania layer was deposited on the electrode by doctor blading a paste based on P25 Degussa powder. The paste was prepared as explained in previous publications [1,2]. To obtain an approximate thickness of 10μM the process was repeated for the second time. This layer was also calcined at 550°C. CdS sensitization was done by Successive Ionic Layer Adsorption and Reaction (SILAR). 0.1M cadmium nitrate and 0.1M of sodium sulfide were used as the source of cadmium and sulfide ions, respectively. The SILAR cycles were repeated until a bright yellow color was observed on the electrode surface (approximately 10 cycles). The electrode was first dried under the flow of nitrogen and then in an oven at 70°C.

References

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