Supporting Information

Z-scheme Bi_2MoO_6/CdSe-diethylenetriamine heterojunction for enhancing photocatalytic hydrogen production activity under visible light

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Characterization

Powder X-ray diffraction (XRD) of pure CdSe, CdSe-DETA, Bi_2MoO_6 and Bi_2MoO_6/CdSe-DETA composites were recorded by Rigaku D/MAX 24000 diffractometer. Scanning electron microscopy (SEM S4800) and high resolution transmission electron microscopy (HRTEM JEOL JEM 2010) were used to characterize the morphology and structure of the as-prepared samples. The X-ray photoelectron spectroscdpy spectra (XPS) of Bi_2MoO_6/CdSe-DETA composites were recorded by Thermo ESCALAB 250 under room temperature. The Brunauer-Emmett-Teller (BET) specific surface areas were recorded by a Micromeritics ASAP 2040. The optical performance of the as-prepared samples was characterized by UV-Vis diffuse reflectance spectroscopy (PerkinElmer Lambda 950) and photoluminescence spectra (PL FLS920), respectively. Shanghai Chenhua CHI-660D electrochemical workstation with three electrodes was used to test the electrochemical properties of photocatalysts. Here, Pt wire, calomel electrode and 1 M Na_2SO_4 were utilized as counter electrode, reference electrode and electrolyte, respectively.

Photocatalytic H_2 evaluation

Photocatalytic H_2 evolution tests of Bi_2MoO_6, CdSe, CdSe-DETA and x%Bi_2MoO_6/CdSe-DETA(x=0.5, 1, 3, and 5) composites were carried out in a 250 mL standard three-mouth reaction vessel containing 100 mL DW. Photocatalyst(50mg), 0.35 M Na_2S and 0.25 M Na_2SO_3 were added into the reactor. Then, 300 μL H_2PtCl_6 (1g/100mL) was injected into the mixed solution.

Disperse the samples by ultrasound and exclude air by N_2 before lighting. The excitation light source is 300 W Xenon lamp equipped with UV-cutoff filter (>420 nm). Keep the distance between the reactor and the light source at 20 cm. The gas chromatography (GC-7900) was used to detect the amount of H_2 production. The apparent quantum efficiency (QE) for H_2 evolution was measured under the same photocatalytic reaction condition. The intensity and number of photons of the light source at 420 nm were measured by an irradiate-meter. The QE was finally calculated according to equation (S1):

$$QE(\%) = \frac{number\ of\ reacted\ electrons}{number\ of\ incident\ photons} \times 100\%$$
$$= \frac{number\ of\ evolved\ H_2\ molecules \times 2}{number\ of\ incident\ photons} \times 100\% \qquad (1)$$

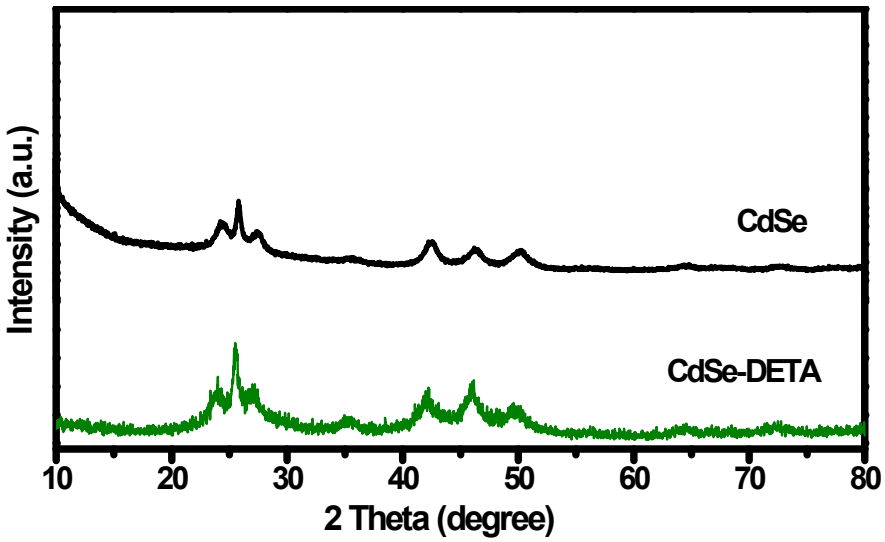

Figure S1. XRD patterns of CdSe and CdSe-DETA.

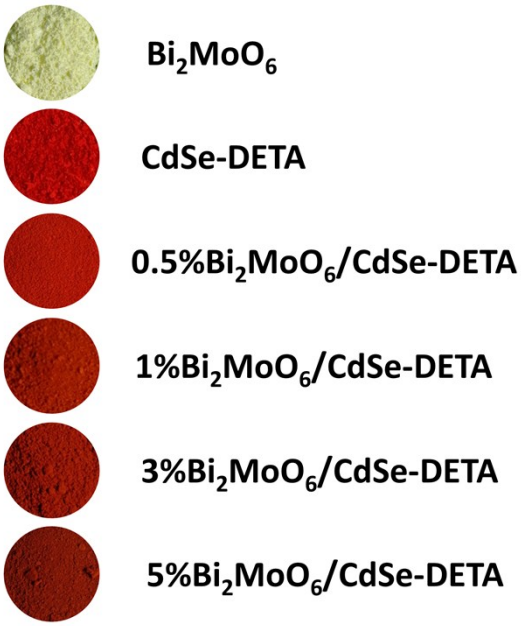

Figure S2. The color of as-prepared samples.