Electronic supplementary information (ESI)

Novel ZnO-ZnS Nanowire Arrays with Heterostructue and Enhanced Photocatalytic Properties

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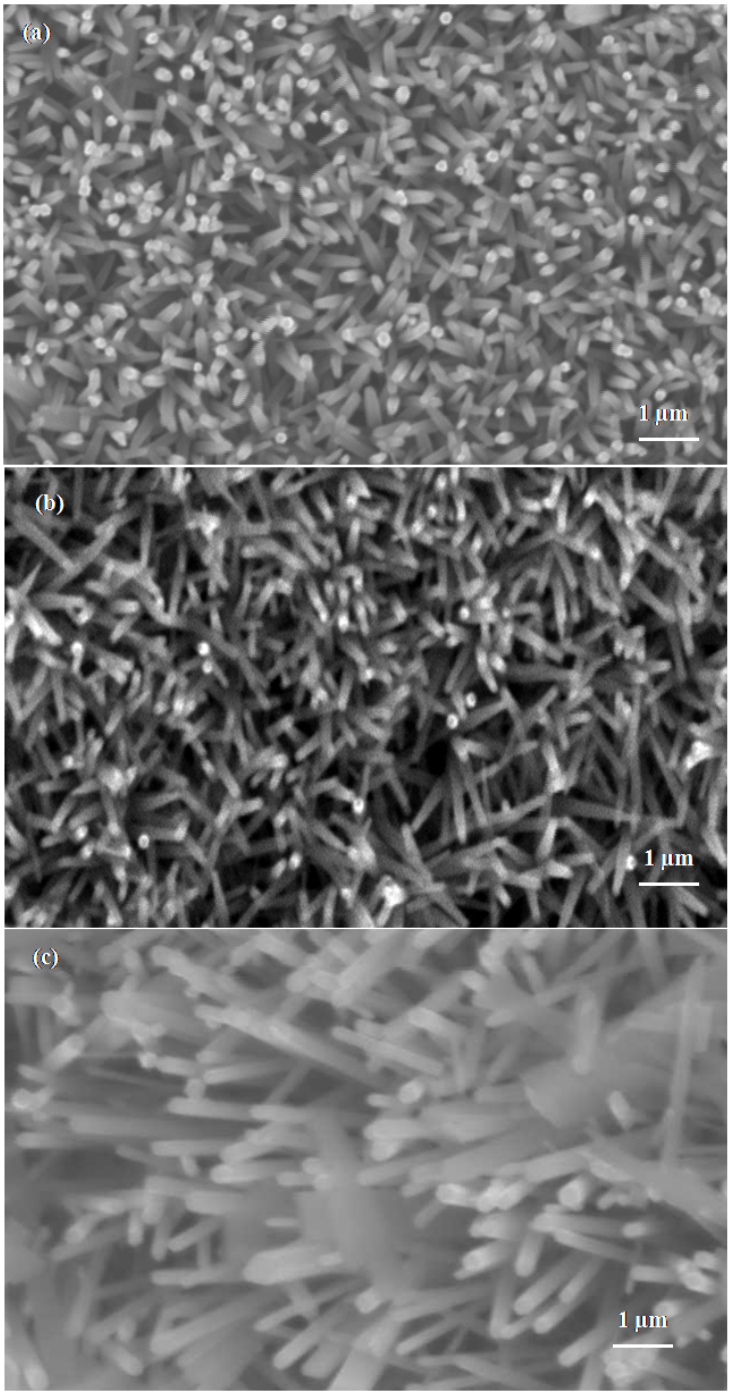

Fig. S1 SEM images of the pure ZnO NW arrays obtained without KSCN at 120-140 ℃ : (a) 6 h, (b) 12 h; (c) SEM images of the pure ZnO nanorod arrays obtained with KSCN at 120 ℃ for 12 h and then heated 160 ℃ for 12h.

To evaluate the stability and reusability of ZnO-ZnS heterostructure NW arrays, the circulating runs in the photocatalytic degradation of methyl orange (MO) under visible light were checked. It can be seen in Fig. S2 that there is no significant loss of the photocatalytic activity of ZnO-ZnS composites after 5 successive runs with each reaction lasting for 40 min. It indicates that ZnO-ZnS heterostructure NW arrays photocatalyst has high stability and does not photocorrode during the photocatalytic oxidation of the model pollutant molecules.

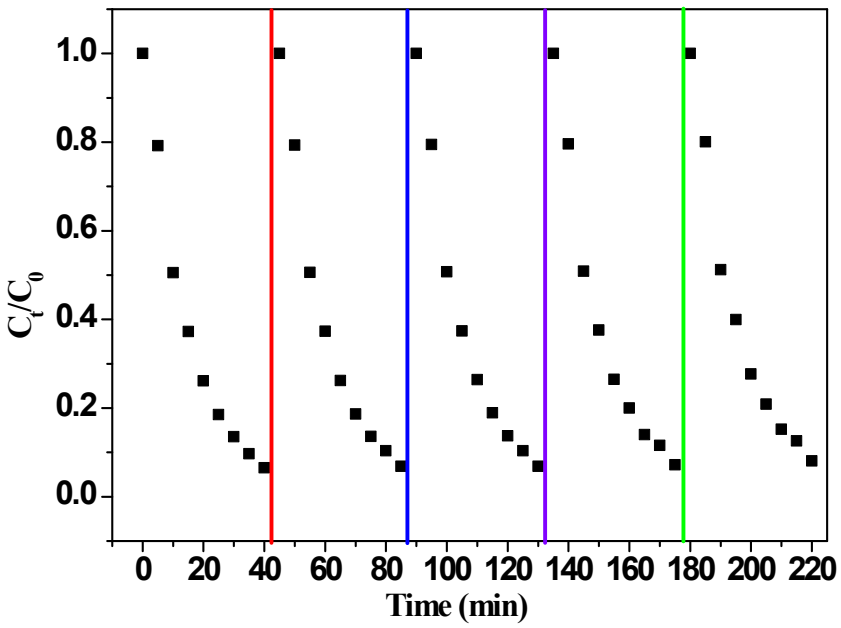

Fig. S2 Cyling runs in the degradation of MO in the presence of ZnO-ZnS heterostructure NW arrays photocatalysts.

On the basis of the characterization results and the photocatalytic measurements for ZnO-ZnS heterostructure NW arrays, a possible photocatalytic H_2 evolution mechanism is proposed as shown in Fig. S3. The SEM images and HRTEM image have proven that almost every tip of ZnO nanowires is occupied by ZnS nanospheres. This would create numerous ZnS-surface-states on ZnO nanowires. The electrons at the ZnO-ZnS interfaces could be excited from the bent VB level induced by the ZnS-surface-states to the CB of ZnO for water reduction. In this way, the effective band gap at the interface would be narrowed, which enables excitation under visible-light irradiation. The photogenerated holes would be trapped by the ZnS-surface-states and subjected to quenching by the sacrificial reagent (S^{2-}/SO_3^{2-}) that facilitates the electron-hole separation [55].

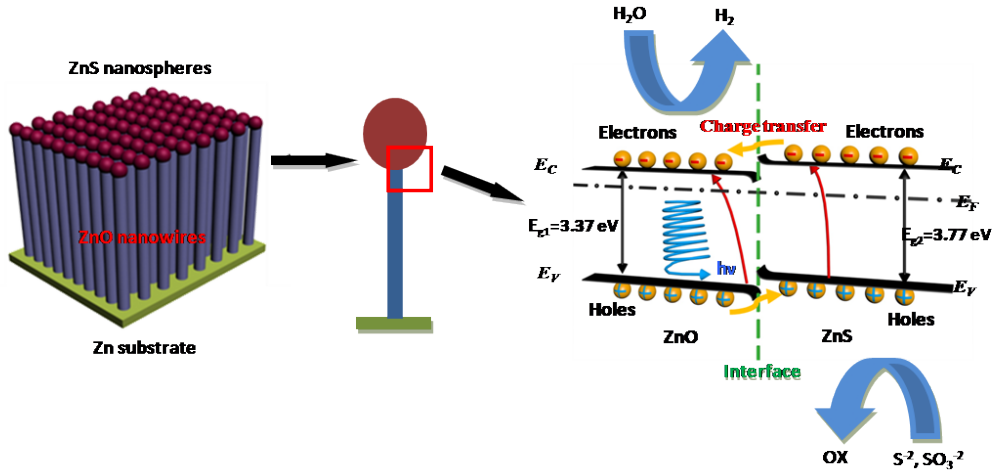

Fig. S3 Schematic illustration of the H_2 evolution mechanism for ZnO-ZnS heterostructure NW arrays under visible irradiation.