Supporting Information

One-pot Preparation and Enhanced Photocatalytic and Electrocatalytic Activities of Ultralarge Ag/ZnO Hollow Coupled Structures

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Figure S1. TEM image of the Ag/ZnO composite with Ag particles attaching to the surfaces of ZnO materials.

| Element | Content (mg/L) | Content (mmol/L) |
|---------|----------------|------------------|
| Ag | 1.17 | 0.01084 |
| Zn | 11.69 | 0.1788 |

Figure S2. ICP result of the Ag/ZnO composite.

16.4mg of Ag/ZnO composite was put in a small beaker and 3mL of 65% nitric acid was added and the mixture was treated by ultrasound to get a clear solution. Then the above solution was diluted to 1L in a volumetric flask. The diluted solution was analyzed by Inductively Coupled Plasma Emission Spectrometer (Agilent 720ES).



Figure S3. SEM and TEM images of the ZnO product prepared without $AgNO_3$ (a) and Ag/ZnO product with half content $AgNO_3$ (1mL of 0.05M $AgNO_3$ solution) (b).



Figure S4. FT-IR patterns of the Ag/ZnO composite (a) and PVP (b).

FT-IR can provide helpful information on the structure of compounds. Fig. S4 shows the FT-IR spectra of the Ag/ZnO composite (a) and PVP (b). There is no organic molecular existing in the Ag/ZnO product because of the absence of C-H stretching at about 2900 cm⁻¹. A pronounced red-shift of O-H band to 3418 cm⁻¹ can be attributed to surface hydroxylation of the ZnO product (Zn-O-H).



Figure S5. TG curve of the hollow coupled Ag/ZnO composite under N₂ flow.

The thermal analysis (TG) result in N_2 is shown in Fig. S5. The thermogravimetric curve indicates that the Ag/ZnO composite has only one obvious mass loss of 5.4 % in the temperature range from 200 to 250 °C, which can be ascribed to a small amount of Zn(OH)₂ existing in the Ag/ZnO composite.



Figure S6. Absorption spectra of RhB in the present of hollow coupled Ag/ZnO product under visible light ($\lambda \ge 400$ nm).

The visible light induced photocatalytic experiments of the obtained Ag/ZnO product were performed in a XPA-Photochemical Reactor (Xujiang Electromechanical Plant, Nanjing, China). A 500 W Xe-lamp with filters ($\lambda \ge 400$ nm) was used in the experiments. The concentration of the catalyst is the same as used in the UV degradation. The absorption spectra of RhB were obtained by a UV-Vis Spectrophotometer (Agilent 8453). There is no catalytic activity for the Ag/ZnO product under visible light in two hours.