

Experimental Section

Experimental Materials

AAO templates with pore diameter of ~250nm and length of 50 μ m were purchased from Whatman Co. Ltd. TiF₄, Pb(CH₃COO)₂, Zn(CH₃COO)₂, Na₂S₂O₃, NaOH, methyl orange were purchased from Sinopharm Chemical Reagent Co. Ltd.

Fabrication of TiO₂/MS (M=Pb, Zn) Core-Shell Coaxial Nanotubes

The AAO template was immersed into TiF₄ solution (0.04mol L⁻¹) for 9 minutes while the temperature of the solution was maintained on about 60°C. Then the product was dried in the vacuum oven at a temperature of 80°C for 1 hour. After drying process, the AAO template with TiO₂ precursors on it was immersed into separate solutions of Na₂S₂O₃ and M(CH₃COO)₂ (M=Pb, Zn) (both are 0.04mol L⁻¹), where the template worked as a septum between the two solutions, and the reaction was carried out in teflon-lined at a temperature of 180°C for 6 hours. Thus far, the fabrication of TiO₂/MS core-shell coaxial nanotube arrays was completed. In addition, bare TiO₂ nanotube array was also fabricated using the similar method.

Characterization of the Experimental Products

The morphologies of the prepared products were characterized by using a scanning electron microscopy (SEM, JEM-2100) and transmission electron microscopy (TEM, JEOL JEM-2100). X-ray powder diffraction (XRD, D-MAX 2500/PC) technology was used to confirm the crystal structure and the elemental composition of the products. X-ray photoelectron spectroscopy (XPS, XSAM800) was used to show the elemental composition, chemical state and existence of the target products. UV-Vis spectrometer (Cary500) was used to measure the light absorption characteristic of the products. For SEM and TEM tests, the AAO templates were dissolved using NaOH solution and the samples TiO₂, TiO₂/PbS, TiO₂/ZnS were all free from the templates. For the UV-visible diffuse reflectance spectra, the samples were all embedded in the AAO templates.

Photocatalytic Degradation of Methyl Orange

Photocatalytic activities of the samples TiO₂, TiO₂/PbS, TiO₂/ZnS (0.08g) was performed in three separate quartz beakers, each containing 60mL methyl orange solution (10mg L⁻¹). The samples were kept being magnetically stirred in the dark for 1 hour to reach the adsorption-desorption equilibrium, and then exposed to UV light from a Hg lamp (300 W, the strongest emission at 254 nm). The change in methyl

orange concentration was monitored by the UV-Visible adsorption of 5.0mL solution taken from each samples every 1 hour.