Photoelectrocatalytic Oxidation of Phenol on Silver Loaded TiO₂ Nanotube Array at High Oxygen Pressure under Luminescent Light Irradiation

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TiO₂ and Ag-TiO₂/Ti-nanotubes were synthesized by electrochemical anodization and UV-light illumination photoreduction methods respectively. Scanning electron microscopy, X-ray diffraction and UV-vis spectrometry were used to characterize the nanotubes. Compared with pure TiO₂, Ag loaded TiO₂ showed higher visible light absorption activity. The characterization results indicate that the surface of the TiO₂ nanotubes partially coated with Ag nanoparticles with an average size of about 50-80 nm. The behavior of phenol at the Ag-TiO₂/Ti nanotubes array photoanode was characterized by linear voltammetry. We have investigated the effect of oxygen pressure to photoelectrocatalytic oxidation of phenol on Ag loaded TiO₂ nanotubes under luminescent light irradiation. Results show that the initial rate of oxidation increases with increasing oxygen pressure. Raising the oxygen pressure in the system from 0.1 to 0.6 MPa caused the initial rate of the photoelectrocatalytic phenol oxidation to increase nearly 1.4 times.

Keywords: photoelectrocatalytic, oxygen, phenol, oxidation, Ag loaded TiO₂ nanotubes.

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