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CdS particles modified TiO_2 coatings formed by plasma electrolytic oxidation with enhanced photocatalytic activity

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Abstract

CdS particles modified anatase TiO_2 photocatalysts were formed on titanium substrate by plasma electrolytic oxidation for 2 min in supporting electrolyte (10 g/L $Na_3PO_4 \cdot 12H_2O$) with addition of CdS particles in concentrations up to 8 g/L. Content of CdS particles incorporated into TiO_2 coatings depends of CdS particles concentration in supporting electrolyte, while surface morphology, phase structure and absorption properties of formed coatings were not significantly influenced by the addition of CdS particles. In contrast to pure TiO_2 coatings, TiO_2/CdS coatings exhibit enhanced photocatalytic activity (PA) in the degradation of methyl orange, used as a model organic pollutant, under simulated solar irradiation. The highest PA was observed for TiO_2/CdS coating formed in supporting electrolyte with addition of 0.4 g/L of CdS particles. Photoluminescence measurements indicate that enhanced PA is related to the reduction of the recombination rate of photogenerated electron/hole pairs as a result of TiO_2 and CdS coupling.

Keywords: Plasma Electrolytic Oxidation; Photocatalysis; TiO_2; CdS.