

عنوان مقاله:

Production of Titanium Dioxide Film by Anodic Oxidation of Titanium Plate and Enhancement of its Visible Light Photocatalytic Activity by Lanthanum Doping

محل انتشار:

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خلاصه مقاله:

Heterogeneous photocatalysis is an efficient technology for removal of organic contaminants through production of highly reactive radicals on the surface of a semiconductor material by photonic activation [1]. TiO_2 is a widely used semiconductor photocatalyst due to chemical, and photochemical corrosion resistance, low solubility in water, low cost and availability. However, this photocatalyst has several restrictions including its limited photocatalytic activity to UV irradiation and difficult separation of the semiconductor particles from refined solution [2]. In this work, at first stage, TiO_2 photocatalyst film was synthesized by anodization of Ti foil in a solution of NH_4F , deionized water, and glycerol. Then the prepared TiO_2 film was calcined to develop anatase crystal form. The effect of applied voltage and calcination temperature on photocatalytic performance of prepared TiO_2 was investigated. The obtained results showed that applied voltage of 30 V and calcination temperature of 600 °C led to prepare UV light active TiO_2 photocatalyst. X-ray diffraction (XRD) pattern, Scanning electron microscopy (SEM), energy dispersion X-ray (EDX) spectrum and diffuse reflectance spectrum (DRS) was used to approve the development of anatase TiO_2 . The diffraction peaks of the prepared sample through the XRD pattern are attributed to the Ti and anatase phase TiO_2 [3]. The SEM image collected for surface of the prepared film shows continuous and uniform development of TiO_2 structures. The EDX analysis indicates the presence of Ti and O in the TiO_2 photocatalyst film. The DRS also indicates the light absorption threshold of TiO_2 catalyst at 380 nm. At the second stage, lanthanum doping on the TiO_2 was done to reduce band gap and improve visible light photocatalytic activity of the TiO_2 film. To synthesis of lanthanum doped TiO_2 (La/TiO_2), after anodization of Ti foil, lanthanum was electrochemically absorbed on the surface of photocatalyst film and then calcined. The effect of lanthanum nitrate concentration and calcination temperature was investigated on the synthesis of La/TiO_2 for degradation of an organic pollutant. According to the obtained results, the sample prepared in the present of 2 mM of lanthanum salt and using calcination temperature of 600 °C showed the highest visible light photocatalytic activity among the prepared La/TiO_2 samples. The presence of La, Ti and O in the La/TiO_2 photocatalyst film was approved by the EDX analysis. Furthermore, according to the DRS ... analysis, La/TiO_2 film exhibits higher visible light absorption intensity than TiO_2 film

کلمات کلیدی:

Titanium Dioxide, Photocatalyst, Anodization, Lanthanum, Visible light

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