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Photocatalytic Destruction of Tetracycline Hydrochloride on the Surface of Titanium Dioxide Films Modified by Gold Nanoparticles

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Films of titania (TiO_2) and titania modified with gold nanoparticles ($\text{TiO}_2:\text{Au}$) were synthesized by a sol-gel method on substrates of glass, aluminum, and aluminum with a layer of nanotextured aluminum or porous anodic alumina. The photocatalytic activity of the samples was investigated in an aqueous solution of the antibiotic tetracycline hydrochloride (TC). TC decomposition was observed in the presence of all samples as a reduction of the solution optical density in the range below 500 nm. Titania was in the crystalline anatase phase with incorporated spherical gold nanoparticles primarily of sizes 1–10 nm after heat treatment at 400°C. Modification of TiO_2 films with gold nanoparticles on glass or aluminum substrates did not increase the photocatalytic activity of the samples. It was found that complexes of TC with Al^{3+} in solution formed only in the presence of gold nanoparticles in the film either in the dark or with UV irradiation.

Keywords

gold nanoparticles titania film aluminum substrate photocatalytic destruction tetracycline hydrochloride

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