



H₂O₂-sensitized titania with activity under visible light and in the dark

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The development of visible-light photoactive materials decomposing pollutants and removing bacteria is a frequent motivation for scientific research. However, the reliance on light to sustain the degradation process restricts the practical application of photocatalysts. In this paper, titania was sensitized with H₂O₂ to overcome this problem and exhibit photocatalytic and dark activity. Efficiency of degradation of standard pollutant (methylene blue) and antibacterial properties (tested on two strains of bacteria: *Enterococcus faecalis* and *Escherichia coli*) were assessed. The comprehensive effect of this material is a result of the peroxide-assisted sol-gel method, without heat treatment, which allows obtaining titanium dioxide with hydroxy and adoxygen groups on the surface and in the volume. The presence of the peroxo and superoxo groups was confirmed using Raman, IR and EPR spectroscopies. The thermal stability of the adoxygen groups was analysed by TG/DSC analysis. X-ray diffraction indicated the formation of an amorphous layered structure. The Tauc plot revealed midgap states which reduced the band gaps towards visible light. The H₂O₂-sensitized TiO₂ was characterized by negative surface potential (pH_{PZC}=3.2) which improved adsorption. The study provides insight for the development of self-cleaning and antibacterial surfaces.

Słowa kluczowe

Yellow TiO₂, Hydrogen peroxide, Peroxo-titanium complexes, Oxidation, Dark, Catalysis

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