HUMAN HAIR-TITANIUM DIOXIDE INTEGRATED IN PHOTOCATALYTIC MICROFLUIDICS REACTOR FOR VISIBLE-LIGHT WATER TREATMENT

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ABSTRACT

Titanium dioxide (TiO2), due to wide band gap, has a limited use in water treatment process because of its low activity under visible light. Such drawback is usually associated with the inadequate solar spectrum that activates its surface, i.e., most of the photoexcited electron–hole pairs tend to recombine, leading to a reduction in the photocatalytic performance. Immobilization of TiO2 on the surface of silicon is considered as a useful approach to overcome this drawback. However, the immobilization methods require high temperature and pressure, which limit the numbers and types of materials that can be utilized as a substrate. The known electrochemical deposition procedures are usually conducted through two major steps, electrochemical oxidation and hydrolysis of Ti(III) precursor to form a thin layer on the surface of the substrate, followed by thermal annealing to form crystalline phase. The present work introduces the immobilization of titanium dioxide on a microporous silicon (MPSi) wafer through direct electrochemical deposition, where titanium dioxide P25 was used in the electrolyte solution. The photocatalyst surface morphology and composition were characterized using SEM, EDX, XRD, and XPS techniques. The photocatalytic activities of the new composites were investigated, and the experimental results indicate that the fabricated TiO2–MPSi showed higher methylene blue degradation rate than that of the conventional P25 catalyst. This is due to the unique photosensitivity and porous structure of the new photocatalytic composites.

Keywords: Titanium Dioxide (TiO2); Solar Spectrum; Immobilization; Hydrolysis

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