Laser- treated Microporous Silicon-Titanium Dioxide Photocatalyst for Water Treatment

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Many materials have been implemented as photocatalyst and most recently the semiconductors. In top of the semiconductors materials, titanium dioxide which considered one of the most effective photocatalyst for water treatment application. Nevertheless, TiO_2 application in water treatment still limited due to the low solar energy used by the system. These limitations are associated to the large band gap energy which limits the solar spectrum that activate the surface and most of the photoexcited electron-hole pairs tend to recombine in TiO2 surface, thus leading to a reduction in the photocatalytic performance. In this paper for the first time, Titanium dioxide was immobilized on laser-microporous silicon wafer type-p. The microporous silicon (MPSi) wafer was prepared by electrochemical etching assisted by laser projection. The laser was used to obtain a regular and uniformed porous on the silicon wafer. Titanium dioxide was immobilized on the surface of the silicon wafer using the sol gel method and electrochemical deposition. The prepared photocatalyst surface and composition was characterized by SEM, EDX, XRD and XPS. Photocatalytic activity of the composites was investigated. The fabricated TiO2-MPSi showed an effective performance in degrading methylene blue higher than the suspension conventional P25 catalyst due to the unique photosensitivity and porous structure of the composites. The calcined catalyst at 550℃ showed the maximum performance of 71% higher than P25 catalyst.