

Title: Simultaneous oily wastewater adsorption and photodegradation by ZrO₂-TiO₂ heterojunction photocatalysts

Type of Paper: Lecture Notes in Mechanical Engineering: Advancement in Emerging Technologies and Engineering Applications

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Publisher: Elsevier Ltd

DOI: 10.1016/j.jwpe.2020.101644

Abstract:

In this work, ZrO₂-TiO₂ heterojunction photocatalysts were successfully synthesized using sol-gel method. The effect of ZrO₂ doped into TiO₂ on the retardation of the electron-hole pairs were investigated. The crystalline structure of ZrO₂-TiO₂ heterojunction photocatalysts was verified through x-ray diffraction (XRD) patterns and the crystallite size were found smaller compared to TiO₂ and ZrO₂ photocatalysts. Morphological characterization evidenced that the co-doping of ZrO₂ into TiO₂ has altered the particle size of TiO₂ and the shape of the synthesized particle through chemical nucleation and growth process in bulk solution. The small crystallite size of the ZrO₂-TiO₂ heterojunction recorded the highest surface area with higher incident in the mesopores volume as confirmed by Brunauer-Emmett-Teller (BET) analysis. The adsorption-photodegradation performance of the ZrO₂-TiO₂ heterojunction photocatalysts on oily wastewater as model pollutant enhanced with the incorporation of small amount of ZrO₂ compared to TiO₂. The presence of surface adsorbed water peaks and hydroxyl groups as disclosed by Fourier transform infrared (FTIR) supported the finding of the study.

Keyword.

ZrO₂-TiO₂ heterojunction photocatalysts, Oily wastewater, Photodegradation, Photocatalytic activity