

**PHOTODEGRADATION OF METHYLENE BLUE IN AQUEOUS MEDIA
USING TiO₂-BASED HETEROGENOUS PHOTOCATALYSTS UNDER
NATURAL LIGHT**

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ABSTRACT

This study developed two heterogeneous TiO₂-based photocatalysts: pure TiO₂ and Fe-doped TiO₂ (Fe-TiO₂). Heterogeneous catalysts were prepared by coating TiO₂ and Fe-TiO₂ powder on glass beads. The photocatalytic activity of both heterogeneous photocatalysts were studied by photodegradation of methylene blue in aqueous solution under two pH conditions (6 and 9) and two ionic concentration conditions (0 and 38 ppt).

The Fe-TiO₂ powder contained minimal amount (2.245%) of Fe as expected. However, surface functionality and ultraviolet-visible (UV-Vis) profile of both TiO₂ and Fe-TiO₂ powder were very similar indicating that doping did not alter these properties. Between the two heterogeneous catalysts prepared, the amount of Fe-TiO₂ catalyst coated on glass beads was lower compared to pure TiO₂.

The removal of methylene blue was significantly affected by ionic concentration which removal is higher at lower ionic concentration (0 ppt). Although it appeared that the removal of methylene blue was higher at pH 9, statistical analyses revealed that the effect was not significant. In addition, the removal of methylene blue by the two catalysts were significantly different. Heterogeneous photocatalyst based on pure TiO₂ showed higher removal of methylene blue in all pH and ionic concentration. Moreover, no interactive effects between variables were observed. Lastly, the blank showed no significant difference on the removal of methylene blue with the heterogeneous photocatalysts which suggest that degradation by direct photolysis from sunlight could be the reason for this result.