PHOTOCATALYTIC ACTIVITY OF $FeTiO_3/TiO_2/PbS$ HETEROJUNCTIONS

U.D.R. Malkanthi

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.

Department of Chemistry, University of Sri Jayewardenepura, Sri Jayewardenepura, Sri Lanka.

The photocatalytic activities of $FeTiO_3/TiO_2/PbS$ heterojunctions under ultraviolet irradiation were investigated for the degradation of methylene blue and rhodamine B. The effects of temperature with different combinations of $FeTiO_3/TiO_2/PbS$ on the degradation efficiencies were investigated.

Catalyst coated (35×60×3 mm) sized glass plates were irradiated with broadband UV light while they were dipped in 150 ml of methylene blue aqueous solutions and 150 ml of rhodamine B aqueous solutions under constant (50 rpm) stirring. Catalyst coated glass plates were prepared by applying wetted catalysts, using distilled water or methanol over the glass plates uniformly and then sintered at 750 °C for 3 hours. Heterojunctions of catalysts were also prepared by same procedure such that catalysts are coated over one another.

Photocatalyst TiO_2 shows the highest activity among $FeTiO_3$, PbS, and TiO_2 surfaces investigated. There was no considerable effect of the temperature on the degradation of methylene blue or rhodamine B neither with any of catalyst or with heterojunctions. The degradation rate of methylene blue showed a highest value for $FeTiO_3/TiO_2$ surface. However, when TiO_2 was combined with other catalysts i.e. $FeTiO_3$ and/or PbS, it was observed that the methylene blue degradation rate was declining. Photocatalyst PbS alone showed a higher degradation rate than $FeTiO_3$ while photocatalyst PbS was combined with other catalysts i.e. $FeTiO_3$ and or TiO_2, it was observed that the methylene blue degradation rate was declining. The degradation rate of rhodamine B showed a highest value for TiO_2 /PbS surface. However, when TiO_2 was combined with other catalysts i.e. $FeTiO_3$ and/or PbS, it was observed that the rhodamine B degradation rate was declining. Photocatalyst PbS alone not showed a more higher degradation rate than $FeTiO_3$ while photocatalyst PbS was combined with other catalysts i.e. $FeTiO_3$ and $FeTiO_3/TiO_2$ both combination shows same degradation rate with the little bit lower than the highest value for rhodamine B.

The results revealed that the optimum photocatalytic oxidation conditions of two dyes are as, methylene blue: Temperature ~50 °C, and $FeTiO_3/TiO_2$ heterojunction under UV irradiation and rhodamine B: Temperature ~50 °C, and TiO_2 /PbS heterojunction under UV irradiation.