

Treatment of ink wastewater via heterogeneous photocatalytic oxidation

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ABSTRACT

This article is mainly concerned with the treatment of wastewater from an ink production plant. The wastewater is highly contaminated with organic and inorganic matter. The chemical oxygen demand (COD) ranged from 5200 to 27458 mgO₂/l. The end-of-pipe has been treated using two alternatives namely, the first treatment alternative chemical coagulation using ferric chloride (FeCl₃) aided with lime, followed by photocatalytic oxidation. The second treatment alternative was direct via heterogeneous photocatalytic oxidation using titanium dioxide/ultraviolet (TiO₂/UV) and hydrogen peroxide (H₂O₂). The optimum operating conditions required for photocatalytic oxidation such as contact time, doses of H₂O₂ and TiO₂ were investigated. The results indicated that the direct treatment of raw wastewater using photocatalytic oxidation reduced the COD, total suspended solids (TSS) and turbidity up to 81%, 95% and 90%, respectively, while the corresponding residual values were 1700 mgO₂/l, 82 mg/l and 100 nephelometric turbidity units (NTU). However, pretreatment of raw wastewater with chemical coagulation followed by photocatalytic oxidation improved the quality of the effluent produced. Residual COD, TSS and turbidity were 420 mgO₂/l, 50 mg/l and 80 NTU, respectively. Also, complete removal of color was achieved. The quality of the treated effluent complies with the National Regulatory Standards for wastewater discharge into a public sewage network.

Keywords: Ink wastewater; Photocatalytic oxidation; TiO₂; UV; Chemical coagulation

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