PHOTOCATALYTIC DEGRADATION OF REMAZOL BLUE USING ILMENITE AND TITANIUM DIOXIDE

A PROJECT REPORT PRESENTED BY

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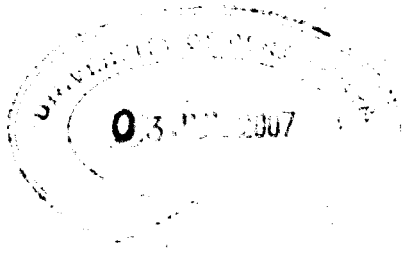

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ABSTRACT

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A naturally occurring substance, ilmenite was investigated for its ability to degrade dyes under sunlight. For the experiment a reactive azo dye, (Remazol blue) was used. Since ilmenite is a mixed of oxide of titanium and iron, the photocatalytic ability of ilmenite was studied.

Aqueous dye solutions of known concentration were treated with ilmenite while oxygen was bubbled through the solution. Photobleaching studies were carried out for 30 ppm Remazol blue dye at pH 3.0 in the presence of 100 mg of ilmenite. This showed a visual discharge of blue color and the gradual loss of optical density of the dye at 601 nm upon irradiation for seven hours. No significant decoloration of the dye was observed in the absence of the catalyst or sunlight, which suggests that photobleaching was purely photocatalytic. It was found that a remarkable decrease in absorbance in the first two hours of irradiation which could be attributed to the adsorption of the dye on ilmenite surface. Thereafter, a slow change in absorbance with time was observed.

The analysis of degradation products for nitrate, sulfate and ammonia were carried out by Cd-reduction method, turbidimetric and the indophenol blue method respectively. A considerable yield of nitrate (64.0 ppm) and sulfate (90.0 ppm) ions in comparison to controls revealed that sulfur and nitrogen moieties of the dye were converted to such simple inorganic ions. However, no detectable amount of ammonia was observed during the irradiation period.

In order to check the degree to which the degradation or mineralization of the dye had occurred upon irradiation, chemical oxygen demand (COD) was determined at different time intervals in the irradiation processes. The percentage reduction of COD assays was high up to 83.67%. COD values decreased from 741.0 ppm to 121.0 ppm confirming that the effective photocatalytic ability of ilmenite that converted the original dye into simpler inorganic compounds.