

Azadrachea indica Leaves Extract Assisted Green Synthesis of Ag-TiO₂ for Degradation of Dyes in Aqueous Medium

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Abstract : Aqueous pollution due to the textile industry is an important issue. Photocatalysis using metal oxides as catalysts is one of the methods used for eradication of dyes from textile industrial effluents. In this study, the synthesis, characterization, and evaluation of photocatalytic activity of Ag-TiO₂ are reported. TiO₂ catalysts with 2, 4, 6 and 8% loading of Ag were prepared by green methods using Azadrachea indica leaves' extract as reducing agent and titanium dioxide and silver nitrate as precursor materials. The 4% Ag-TiO₂ exhibited the best catalytic activity for degradation of dyes. Prepared catalyst was characterized by advanced techniques. Catalytic degradation of methylene blue and rhodamine B were carried out in Pyrex glass batch reactor. Deposition of Ag greatly enhanced the catalytic efficiency of TiO₂ towards degradation of dyes. Irradiation of catalyst excites electrons from conduction band of catalyst to valence band yielding an electron-hole pair. These photoexcited electrons and positive hole undergo secondary reaction and produce OH radicals. These active radicals take part in the degradation of dyes. More than 90% of dyes were degraded in 120 minutes. It was found that there was no loss catalytic efficiency of prepared Ag-TiO₂ after recycling it for two times. Photocatalytic degradation of methylene blue and rhodamine B followed Eley-Rideal mechanism which states that dye reacts in fluid phase with adsorbed oxygen. 27 kJ/mol and 20 kJ/mol were found as activation energy for photodegradation of methylene blue and rhodamine B dye respectively.

Keywords : TiO₂, Ag-TiO₂, methylene blue, Rhodamine B., photo degradation

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