Photocatalytic Oxidation of Methylene Blue by ZnO/Ag-polystyrene Film as a Method for Water Treatment

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Abstract:

Water loaded with dyes is real problem results from industrial pollution as a dramatic action on environment and effects on living organisms. Treatment of water need a method with quality features like high efficiency, low cost, long time of work, non-harmful byproducts and reproducibility. Photocatalytic oxidation used as treatment of dyes like methylene blue and zinc oxide as catalyst in the presence of uv light and the result is degradation of dye. First step is preparation of ZnO/Ag composite by Ag photodeposition on ZnO surface. ZnO/Ag characterized by SEM, EDX, XRD, UV. VIS. spectra and FTIR analysis to study the modification and morphology of ZnO/Ag. Second step is preparation of ZnO/Ag-polystyrene film by mixing composite powder with polystyrene solution then casting is done and evaporating of solvent, the film is made. Three films were made: polystyrene(p), ZnO-polystyren (Zp) and ZnO/Ag-polystyrene (ZAgp) and all of them were tested for photocatalytic degradation of methylene blue in the presence of uv light in the same conditions and the efficiency was in the sequence as following: ZAgp> Zp>p > photolysis, where photolysis is photoreaction without catalyst. Efficiency of ZAgp film was 98% in 2 hours, where all the color of dye disappeared while it was 90% for Zp film, this attribute to the Ag sensitization that made modification of ZnO surface changing the active sites, surface area and prolong life time of electron-hole pair. ZAgp and Zp films were used for reproducibility experiment and found that the films are efficient for three times of degradation in same concentration of Dye where ZAgp>Zp in efficiency after three times of using same film each time was 95% and 75% respectively.

Keywords: photocatalysis, methylene blue, photodeposition.

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