



The role of fly ash in solar photocatalytic water treatment

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ABSTRACT

To investigate the possibility of using waste material in the water purification, fly ash (FA0) was modified and built-in within composite TiO₂-FA. In that purpose, titanium dioxide (TiO₂) was prepared *in-situ* by sol-gel synthesis in the presence of FA. The morphology, surface, structure and optical properties of obtained composite were compared to those of pure TiO₂, synthesized by the same procedure as TiO₂-FA. Both photo catalysts were then used in solar driven treatment of reactive azo dye Reactive Red 45 (RR45), exploring the influence of following process parameters: initial pH, photo catalyst dosage and initial RR45 concentrations, on the overall effectiveness. The reusability of TiO₂-FA and TiO₂ has also been explored. Modification of FA0 significantly increased its surface area. Synthesized TiO₂ was highly crystalline and of anatase phase only, regardless the presence of FA. Band gap of TiO₂-FA is slightly lower than that of TiO₂, indicating that composite might have higher activity under solar irradiation. However, it was found that TiO₂ is more effective, except at extreme conditions tested (the lowest pH and highest photo catalyst dosage), presumably because composite had 16 wt% less photo catalytically active component. On the other hand, composite underwent easier separation after the treatment that facilitated its reuse more efficiently.

Keywords: Fly ash; Material synthesis and characterization; TiO₂-based composite; Solar photo catalysis; Water treatment

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