Sol-gel synthesis of Fe_2O_3-doped TiO_2 for optimized photocatalytic degradation of 2, 4-dichlorophenoxyacetic acid

ABSTRACT

Fe_2O_3-doped and undoped TiO_2 catalysts were synthesized by sol-gel method and used to optimize the photocatalytic degradation of 2,4-Dichlorophenoxyacetic acid (2,4-D). The catalysts produced were dominated by the tetragonal, crystalline anatase TiO_2 cell structure. The 0.05wt% Fe_2O_3-doped TiO_2 catalyst exhibited higher photocatalytic activity than that of undoped TiO_2 but its performance decline with increase Fe_2O_3 content due to possible increase of recombination centers. Photocatalytic degradation of 2,4-DA was optimized by response surface methodology. The highest 2,4-DA degradation (48%) was obtained when 1.0 g of 0.05wt% Fe_2O_3-doped TiO_2 is used to degrade 10 ppm of 2,4-DA at pH 4.

Keyword: Fe_2O_3-TiO_2; Sol-gel; Photocatalysis; Response Surface; 2,4-dichlorophenoxyacetic acid