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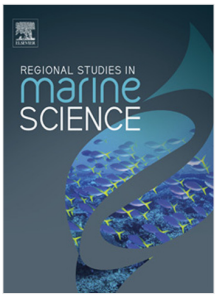

Photocatalytic degradation of diesel pollutants in seawater under visible light

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Photocatalytic Degradation Of Diesel Pollutants In Seawater Under Visible Light

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Abstract: Photocatalyst composites were prepared by coprecipitation and characterized by XRD, SEM, and UV-Vis DRS methods. A substantially enhanced photocatalyst activity was observed in degradation of diesel pollutants in seawater, compared to zinc oxide without dopant. Photocatalytic degradation of diesel pollutants in seawater and the effects of factors on the composite's photocatalytic effectiveness were studied under visible light and various conditions. This degradation in seawater was optimized using an orthogonal experimental plan. According to the results, diesel removal was 26.95% without any catalyst (losses only by evaporation) and the greatest effects occurred when the initial diesel concentration was 0.25 g/L, catalyst dose at 0.4 g/L, catalyst-doping ratio at 10%, pH at 9.0, H_2O_2 at 6.0 mg/L, and illumination time at 2.5 h, in which case the diesel removal rate reached 93.89%. This study elaborated a means for making zinc oxide utilize visible light more efficiently and thus accelerate the practical application of photocatalytic technology in organic pollutant remediation.

Keywords: Ytterbium oxide; Zinc oxide; photocatalytic degradation; visible light; diesel pollutants.

1 Introduction

For pollution ion uptakes for water remediation, there are various methods, such as physical, chemical, and biological methods. A physical method is most commonly used to deal with water pollution, but it consumes human and financial resources and has a poor pollutant removal rate. A chemical method can remove pollution more efficiently, but it can easily cause secondary pollution and high costs. A biological method is greatly affected by the surrounding environment and the reaction rate is slow. Photocatalysis has the advantages of being a simple process, with no secondary pollution, and and nearly all the pollutant constituents are mineralized. Semiconductor photocatalytic materials have attracted great interest over the past decade for their light-stimulated degradation of aqueous pollutants [1]. A study of ultraviolet (UV) upconversion luminescence in Y_2O_3:Yb^{3+},Tm^{3+} nanocrystals with TiO_2 and their application in photocatalysis has shown that this