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Phocatalytic Dye Degradation Activities Of Chitosan Film Modified By Green Synthesized Tio_2 From Aloe Vera Leaf Extract

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Extended Abstract

Recent research focuses on heterogeneous photocatalysis, an environmentally friendly and cost-effective method that uses solar energy to completely degrade pollutants without generating secondary waste. The focus is optimizing the properties of photocatalysts in terms of electronic structure, light absorption, and reduced recombination rate of photogenerated charges and easy separation of the photocatalyst from reaction media [1]. The potential for efficient, sustainable heterogeneous photocatalysis has been demonstrated by semiconductors such as TiO_2, ZnO, Fe_2O_3, CdS, CuS, and ZnS [2]. TiO_2 is regarded as one of the most effective photocatalysts. The usage of TiO_2 for the degradation of hazardous organic dyes in wastewater has significant potential. The separation of the photocatalyst from the reaction medium remains a significant challenge in photocatalytic applications. In particular, the recovery of TiO_2 after the degradation of organic dyes poses a considerable difficulty, as its fine particulate nature hampers efficient separation from the treated solution. One of the strategies in this regard is the immobilization of the photocatalyst by embedding it into a polymer matrix. This approach facilitates easier separation of the photocatalyst from the reaction medium [3]. Chitosan, a natural biopolymer widely used for its biodegradability and biocompatibility, is an attractive candidate for hydrogel development due to its functional groups that serve as cross-linking sites during hydrogel formation. It has also been combined with photocatalysts and utilized in numerous studies [4-6]. In this study, green-synthesized TiO_2-embedded chitosan films (Bio-TiO_2-CS films) prepared using aloe vera leaf extract offer the advantage of facile separation after the degradation process, as well as potential reusability following dye removal. As the goal of the study, it is believed that the obtained chitosan film hydrogels can be used as an effective bio-template material to disperse TiO_2 nanostructures due to their three-dimensional porous structure and appropriate nanopore size distribution, and this feature has led us to investigate the simpler, recyclable, green approach, and biomaterial development of the use of Bio-TiO_2-CS Hydrogel Films in photocatalytic dye removal from water.

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