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Photocatalytic activity of TiO_2/graphene and TiO_2/graphene oxide nanocomposites

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Semiconductor-based heterogeneous photocatalysis has been one of the most promising processes for the treatment of contaminated water. Among the available catalysts, titanium dioxide (TiO_2) presents the best photocatalytic properties, being chemically and biologically inert, stable, non-toxic, cheap and easy to produce. However, its energy bang gap lies in the ultraviolet (UV) range, which is responsible for a reduced spectral activation, since UV radiation corresponds to only 5% of the solar spectrum [1]. For this reason, one of the main purposes of the scientific community has been to improve the photocatalytic performance of TiO_2, namely through an adequate doping of this material, or through the creation of nanocomposites, to enable photocatalysis occurrence by the incidence of visible light. One alternative concerns the application of nanocomposites of TiO_2 with graphene and graphene oxide to photocatalytic processes [2].

In this work, nanocomposites of TiO_2 with different weight concentrations of graphene and graphene oxide (namely 0.5%, 1%, 1.5% and 3%) were synthetized by a one-step hydrothermal method and characterized in terms of morphology, crystalline structure, vibrational modes and optical band gap. The photocatalytic activity of these nanocomposites was then evaluated through the degradation of methylene blue and ciprofloxacin solutions under UV and visible radiation. The results indicated that the studied nanocomposites presented higher degradation rates of the methylene blue than the pure TiO_2, which increased with the content of graphene/graphene oxide. However, these composites proved to be less suitable to degrade the ciprofloxacin solution than the pure TiO_2 nanoparticles.

References:

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