From TiO_2 and Graphite to Graphene doped TiO_2 for visible light photocatalytic degradation of refractory dye.

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Graphene production is an ongoing challenge for large-scale applications. Many processes are used to produce graphene [1]. Top-down method such as the exfoliation of graphite powder in liquid phase by sonication is a promising route to create high quality graphene in great quantity due to its simplicity, its versatility and its low-cost [2]. Graphene with the thickness of a single carbon atom owns unique physical and chemical properties like large surface area, highly flexible structure, high electrical and thermal conductivity and high chemical stability [3]. With these properties, graphene is an attractive material in applications that require a fast electron transfer, such as photocatalysis. In fact, graphene based semiconductor nanocomposites are considered as good photocatalyst for pollutant degradation [4]. Graphene is an ideal nanomaterial for doping TiO_2 because the formation of Ti-O-C bonds extend the visible light absorption of TiO_2. Furthermore, electrons are easily transported from TiO_2 to graphene nano-sheets and the electron-hole recombination is reduced; this is enhances the oxidative reactivity [5].

In this work, graphene doped TiO_2 nanocomposite was used as photocatalytic materials for the Alizarin Red S degradation in water solutions. Graphene dispersions were prepared by liquid-phase exfoliation of graphite in the presence of a non-ionic surfactant, Triton X-100. The obtained graphene dispersion was characterized by X-Ray Diffraction, Dynamic Light Scattering and UV-Visible spectroscopy and was subsequently used for the preparation of graphene doped-TiO_2 photocatalyst. Graphene doped-TiO_2 nanocomposites showed higher adsorption of Alizarin Red S on the catalyst surface and higher photocatalytic activity for its degradation under visible light irradiation, respect to those obtained with pure TiO_2 [6].

References:

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