

## NANO-STRUCTURED CATALYSTS APPLIED TO HETEROGENEOUS PHOTO-FENTON PROCESS TO DEGRADE HERBICIDES IN AQUEOUS PHASE

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The Fenton ( $\text{Fe}^{2+}/\text{H}_2\text{O}_2$ ) and photo-Fenton ( $\text{Fe}^{2+}/\text{H}_2\text{O}_2/\text{UV-Vis}$ ) reactions appear as very promising options for the oxidation of a wide range of recalcitrant organic pollutants. The application of these processes to wastewater treatment has aroused great interest mainly due to the fact that Fe is a widely available and nontoxic element, and hydrogen peroxide is easy to handle and the excess decomposes to environmentally safe products [1]. Depending upon the phase, the Fenton and photo-Fenton reactions may be carried out under homogeneous or heterogeneous conditions. Nevertheless, it has been reported that the conventional homogeneous Fenton process based methods suffer from some drawbacks such as (i) the precipitation of soluble iron ions as hydroxide precipitate under neutral pH or alkaline conditions [2], (ii) the requirement of strict pH regulation around 2.8-3 [3], and (iii) the requirement of post-treatment prior to discharge, such as neutralization of the treated solutions [4]. Some of the drawbacks of the conventional Fenton process can be avoided by the use of a heterogeneous catalyst. Mesoporous materials have received widespread interest because of their good distribution of pore size/volume; this allows hundreds of molecules to effectively diffuse to internal active sites, increasing their activity per unit of volume [5]. In previous works, mesoporous materials have been modified like SBA-15 and KIT-6 with Fe showing excellent physical, optical and catalytic properties [6]. In the present work, mesoporous photocatalysts supporting Fe species on SBA-15 and KIT-6 were prepared, for their application in the photo-Fenton heterogeneous reaction for the degradation of the commercial herbicide (atrazine, ATZ) in water. The different mesostructures obtained were characterized by N<sub>2</sub> adsorption-desorption at 77 K, TPR and UVVIS-RD. These iron-containing mesostructured materials have been successfully tested for the heterogeneous photo-Fenton degradation of ATZ aqueous solutions using UV-visible irradiation at room temperature and close to neutral pH. Depending on the dispersion and size of the different iron species, the nanocomposites showed different catalytic behaviors. The results showed that the Fe/SBA-15(10) and Fe/KIT-6(5) catalysts exhibited the highest activities. Thus, the high performance of these materials indicates that the heterogeneous via of photo-Fenton process can also be efficiently employed to treat wastewaters containing pollutants such as herbicides, in order to reduce them to simpler and less toxic molecules.

**Keywords:** *mesostructures, heterogeneous Photo-Fenton, herbicides, degradation.*

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