

HIGH CONCENTRATED PHENOLIC WASTE WATERS TREATMENT BY HETEROGENEOUS AND HOMOGENEOUS PHOTOCATALYSIS. MECHANISM STUDY BY FTIR-ATR

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Topic: Photocatalysis (Photocatalytic reaction Mechanism and Kinetics)

ABSTRACT

Phenol degradation by UV-TiO₂ and PhotoFenton reaction has been studied in high concentrated waste waters and most intermediate species have been identified by Fourier Transform IR-Spectroscopy with ATR device. During the photodegradation of highly concentrated phenol solutions the formation of dissolved and precipitate tannin has been observed. The possibility of a Fe³⁺ - Pyrogallol complex formation, previous to the tannin formation, has been proposed too. The complex formation involving Fe³⁺ ions could be related to the observed PhotoFenton activity decrease. For the UV-TiO₂, low size tannin deposition on the TiO₂ particles surface produces the catalyst inactivation, which can be reactivated by thermal- and photo- treatments. Tannin formation inhibits the complete mineralization of phenol because OH radicals attack will produce further condensation steps and the polymer size increase. This fact limits the applicability of these processes for highly concentrated phenolic wastes mineralization. However, the tannin precipitation allows its separation from the solution by conventional filtration, and the corresponding dissolved organic carbon diminution. These observations have been proved from the identification of primary degradation products, cathecol and hydroquinone. Cathecol is considered to be the first step for the formation of tannins. Degradation process for phenol, cathecol and hydroquinone have been monitored by total organic carbon measurements along the reaction time span. From these results, a global mechanism for the phenol degradation is proposed.