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## CATALYTIC WET HYDROGEN PEROXIDE OXIDATION OF 4-CHLOROPHENOL OVER IRON-EXCHANGED CLAYS

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### Abstract

Chlorophenols were selected for this study because most of them are toxic and difficult to biodegrade. They represent a particular group of priority toxic pollutants listed by the US EPA in the Clean Water Act and by the European Decision 2455/2001/EC. The efficiency of advanced oxidation processes for degradation of chlorophenols has been extensively documented. The catalytic wet hydrogen peroxide oxidation process, involving oxidation with H<sub>2</sub>O<sub>2</sub> and solid catalysts in mild reaction conditions, was found to be very attractive for different pollutants; however, data regarding the degradation of chlorophenols are very scarce. The aims of this paper were: (i) to prepare and characterize a series of iron-exchanged montmorillonites and (ii) to assess their catalytic performances in a Fenton-like process for the oxidation of para-chlorophenol. DR-UV-VIS spectroscopy was tentatively used to elucidate the structure of the iron oxo sites intervening in the reaction. This approach has been used previously for ion-exchanged zeolites and was able to distinguish between isolated Fe(III) species and Fe<sub>x</sub>O<sub>y</sub> clusters of different nuclearity. The catalytic tests, performed at room temperature, showed that all iron-containing clays were very active, leading to the complete oxidation of para-chlorophenol and a significant reduction of TOC values. 4-chlorocatechol was the major reaction intermediate found in the CWHP of 4-CP, followed by hydroquinone and traces of benzoquinone, 5-chloro-1,2,4-benzenetriol, 1,2,4-benzenetriol and 3-chloro-muconic acid. The leaching test indicates that the catalytic activity is mainly due to leached iron ions, at least in the second part of the process.

*Key words:* 4- chlorophenol, catalytic wet peroxide oxidation, clay, hydrogen peroxide

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