

Iron (2,3) oxides based nano-particles as catalysts in advanced organic aqueous oxidation

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ABSTRACT

Contamination of water with organic pollutions presented significant ecological problem. For water purification from organic pollutions biological and chemical oxidation processes are suitable. Biological treatment process is usually slow and limited when the dissolved organic matter is toxic, inhibitory or recalcitrant to microorganisms. The degradation and mineralization of organic pollutants in wastewater by advanced oxidation processes (AOPs) is useful for purifying drinking water, groundwater and for cleaning industrial wastewater has been reported recently. It may also be useful as pretreatment for RO and NF water purification. The degradation and mineralization of organic pollutants in contaminated water by AOPs is based on the generation of a very reactive free hydroxyl radical (OH). The hydroxyl radicals are highly reactive, non-selective and may be used to degrade a wide range of organic pollutants. It reacts with most organic compounds by adding to a double bond or by abstracting hydrogen atoms from organic molecules. Nanoparticles of metal oxides and semiconductors are of great attention due to novel properties compared to their bulk materials. Iron (3) oxide-based nanocatalyst efficiently destroyed organic contamination by the Fenton-like reaction in the presence of hydrogen peroxide at room temperature without the need for ultraviolet light (UV) or visible radiation sources. A strong effect of nanocatalyst concentration on reaction rate was shown. The kinetic reaction was found and the reaction rate coefficient k was calculated. The objective of this research work is to continue the efforts of investigation catalytic behavior of the different iron oxide-based nanocatalyst by degradation and mineralization organic pollutants in wastewaters as a possible mean of treatment for contaminated groundwater and industrial wastewater. Typical organic contaminant: ethylene glycol was chosen for this study as simulating pollutants.

Keywords: Fenton process; Water treatment; Organic pollutants; TOC; AOP; Ethylene glycol; Nanocatalyst; Iron oxide; Reaction rate

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