



Wastewater mineralization using advanced oxidation process

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ABSTRACT

Water scarcity and environmental considerations are leading to the search for alternatives for industrial and urban wastewater reclamation. The objective of this research study was to examine the potential of recycling wastewater as an alternative or complementary technique for biological treatment. The degradation of organic matter from strained sewage and secondary treated sewage was studied using the advanced oxidation process (AOP) with hydrogen peroxide as an oxidant and iron oxide-based nanocatalysts. This process may be used when contaminants are resistant or toxic to conventional biological treatments. It also may be used as a complementary technique for polishing treated water. AOP, which involves the in situ generation of extremely strong oxidants such as hydroxyl radicals in aqueous solution, has recently appeared as a remarkable technique for accelerating the oxidation and degradation of a broad range of organic matter in wastewater. The final products of this process are carbon dioxide, water and inorganic salts. The oxidation of an organic compound by AOP is catalyzed by using transition metal oxides such as iron oxides. Another alternative for removing organic pollutants from aqueous streams is adsorption on activated carbon. The AOP process may be used on loaded active carbon or other adsorbents for cold regeneration, followed by successive repeated recycling of the adsorbent. It was shown that organic matter is efficiently destroyed by the Fenton-like reaction using FeOOH in the presence of hydrogen peroxide. The strong effect of nanocatalyst and hydrogen peroxide concentrations on reaction rate is demonstrated. The kinetic reaction was evaluated, and the reaction rate coefficient k was calculated. The optimal pH for destroying the organic matter was found to be around 2.7. Moreover, the results show high efficiency catalytic recovery of used activated carbon after treatment of filtered raw or secondary treated sewage, enabling the inexpensive reuse of the adsorbent.

Keywords: Goethite; Organic pollutants; Fenton-like process; TOC; AOP

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