PhD Candidate Profile

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Advanced Oxidation Process Group

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Funding body:

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Area (field) of study:

Photochemistry, Environmental Chemistry

Thesis Title:

Emerging Photochemical Process Involving Iron for Wastewater Treatment

Abstract:

Over the last few decades, global aquaculture production has grown dramatically, from 0.6 million tons in 1950, the annual production has reached 79 million tons in 2010 (FAO 2010). Of the drugs approved for aquaculture, antibiotics are among the most widely administered. Administration methods include incorporation in feed and direct injection. The presence of these pollutants in the aquatic environment presupposes a potential risk for the health of living beings since it has been found that some drugs can favour the development of multi-resistant strains in pathogenic bacteria as well as affecting the endocrine system of fishes and even can exert toxic effects on algae and invertebrates. The removal of these ones also is very ineffective by the conventional water treatment technologies, therefore advanced oxidation process (AOP) are alternatives to traditional water treatments.

The photo-Fenton process is an AOP that is receiving increasing attention from researchers. Its oxidative action is a result of the formation of reactive oxygen species, especially hydroxyl radicals ($HO^{\bullet}$) that are able to oxidize most of the organic pollutants. Despite its advantages of being economical and environmentally friendly, the photo-Fenton reaction

has not been widely used due to the requirement of acidic conditions (optimal pH 2.8), since at higher pH values the formation of non-active iron oxides or hydroxides substantially decreases the efficiency of pollutant removal.

Interest has grown over the past few years, in the application of circumneutral photo-Fenton processes for wastewater treatment. One approach to avoid acidification and ferric iron hydroxide precipitation is performing the reaction with complexing agents. It has been demonstrated that Fe(III) can be strongly complexed with different polydentate ligands. Humic substances (HS) are among the materials employed for this purpose, because of their ability of iron complexation. On the other hand, experimental results seem to prove that HS under UV-Vis irradiation can directly improve the degradation of pollutants by speeding up the redox cycling of iron due to the ligand to metal charge transfer (LMCT) reactions of their ferric complexes, thus accelerating the photo-Fenton mechanism. Nevertheless, the role played by HS in the oxidation mechanism is still not fully understood.

Collaborations:

N/A

Publications:

N/A

Presentations:

N/A