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Role of Organic Wastewater Constituents in Iron Redox Cycling for Ferric Sludge Reuse in the Fenton-Based Treatment

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Abstract : The practical application of the Fenton-based treatment method for organic compounds-contaminated water purification is limited mainly because of the large amount of ferric sludge formed during the treatment, where ferrous iron (Fe(II)) is used as the activator of the hydrogen peroxide oxidation processes. Reuse of ferric sludge collected from clarifiers to substitute Fe(II) salts allows reducing the total cost of Fenton-type treatment technologies and minimizing the accumulation of hazardous ferric waste. Dissolution of ferric iron (Fe(III)) from the sludge to liquid phase at acidic pH and autocatalytic transformation of Fe(III) to Fe(II) by phenolic compounds (tannic acid, lignin, phenol, catechol, pyrogallol and hydroquinone) added or present as water/wastewater constituents were found to be essentially involved in the Fenton-based oxidation mechanism. Observed enhanced formation of highly reactive species, hydroxyl radicals, resulted in a substantial organic contaminant degradation increase. Sludge reuse at acidic pH and in the presence of ferric iron reductants is a novel strategy in the Fenton-based treatment application for organic compounds-contaminated water purification.

Keywords : ferric sludge recycling, ferric iron reductant, water treatment, organic pollutant
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