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Effect of initial pH on the tetracycline (TC) removal by zero-valent iron: adsorption, oxidation and reduction

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Abstract: In this study, the effect of initial pH on tetracycline (TC) removal by zero-valent iron (ZVI) has been investigated thoroughly. The experimental results show that TC degradation efficiency performed effectively across the initial pH range 2.5 - 6.5, almost all removal efficiencies in this range reached 90% after 30 min treatment. As pH increasing to alkaline, removal efficiencies gradually decreased. Experimental results indicate that removal of TC by Fe^0/air process is mainly attributed to adsorption (by Fe^0 and its corrosion products), oxidation and reduction. pH significantly affected the formation of iron corrosion products, the production of hydroxyl radicals ($HO^{\bullet}$) and the variation of TC species. Adsorption is the main removal path under neutral conditions while oxidation is the prime removal way under acidic conditions. Finally, the intermediates and toxicity analysis indicates that less toxicity products generated through ring-opening reactions. The study provides new insight into the removal of TC by ZVI and support a theoretical foundation for further research.

Keywords: Tetracycline (TC); Zero-valent iron (ZVI); pH; Adsorption; Oxidation

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