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A study of the variations of oxidation–reduction potential, pH, and dissolved oxygen during photo-Fenton oxidation of methyl tert-butyl ether in the presence of a nanosized zero-valent iron particle, hydrogen peroxide, and ultraviolet radiation

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ABSTRACT

The changes in oxidation–reduction potential (ORP), pH level, and dissolved oxygen (DO) concentration during the redo/oxidative degradation of methyl tert-butyl ether (MTBE) by nanosized zero-valent iron (nZVI) combined with hydrogen peroxide addition and ultra-violate radiation were investigated. The optimal ratio of oxidants depended on the initial concentration of MTBE. For instance, MTBE was completely removed at the 60 min of contact time and with its initial concentration of 0.05 mm MTBE and all nZVI particle/hydrogen peroxide ratios (10:100, 20:200, and 30:300 mg/L). In contrast, 54.2% of MTBE (0.27 mM) remained after 90 min of contact time when its initial concentration was 0.5 mM and the nZVI/hydrogen peroxide ratio was 10:100 mg/L. It was observed during the oxidation process the pH was increased from 4 to 7 and DO was decreased from 9 to 0 mg/L. Significant fluctuation of ORP was observed over the oxidation time. According to results, the initial dose of oxidants can significantly affect the pH levels and DO concentrations of effluent, and ORPs. It can be concluded that in order to achieve the higher removal rate by the nZVI/photo-Fenton process, it is vital to adjust the values of pH, DO, and oxidation–reduction at optimal ranges.

Keywords: Nano zero valent iron (nZVI); Photo-Fenton; Methyl tert-butyl ether; Dissolved oxygen; Oxidation–reduction potential; pH

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