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Effect of H_2O_2 sequential dosing in the Fenton process on leachate treatment

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ABSTRACT

Landfill leachate is infiltration water percolating through the landfill body together with waste ingredients that were washed out and dissolved, and also the products of biochemical reactions that occur in stored wastes. Leachate produced in this way requires specialised treatment, in which it is necessary to account for variability in leachate volume and chemical composition. Advanced oxidation processes, in which highly reactive and non-selective •OH free radicals are produced, constitute an alternative to classical pre-treatment options. Tests were conducted on leachate samples collected from the closed landfill in Barcza in the Świętokrzyskie Province, Poland. Fenton reaction was performed for Fe^{2+} to H_2O_2 ratio of 1:10 and pH = 4 (pH was adjusted using H_2SO_4) for six Fe^{2+} catalyst doses (50, 100, 150, 200, 250 and 300 mg/L) at the temperature of 20°C ± 1°C. The entire Fe^{2+} dose was delivered at the beginning of the process. The impact of H_2O_2 sequential dosing was investigated for four different configurations at Fe^{2+} to H_2O_2 ratio of 1:10. A simple mode of linear sequencing and advanced nonlinear dosing mode were used. It was demonstrated that oxidant sequencing while the catalyst dose is kept constant leads to substantial improvement in total organic carbon, chemical oxygen demand and $UVA_{(254)}$ absorbance compared with a conventional Fenton reaction.

Keywords: Fenton reaction; Leachate; Heavy metals; AOP

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