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Landfill leachate treatment in an integrated adsorption-chemical oxidation process including CNT and nZVI-H_2O_2

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ABSTRACT

Landfill leachate has created many health and environmental concerns. This paper aimed at examining the efficiency of two batch systems, including multiple carbon nano-tubes (MCNT) as a first reactor and "nano-particles of zero valent iron (nZVI) + H_2O_2" processes as a second reactor, for treatment of very strong landfill leachate with the following physiochemical characteristics: 85,000 mg/L chemical oxygen demand (COD), 20,000 mg/L 5-d biological oxygen demand (BOD_5), 200,000 mg/L total solids (TS), and 15,000 TCU color. Experiments were performed in two series batch reactors and main influencing factors, pH, reaction time, concentration of iron and H_2O_2 were investigated. The results display the high potential of absorbing organic materials in leachate by carbon nano-tubes in the first stage of treatment (58% COD, 82% color and 33% TS are reduced within 10 min). The highest obtained removal efficiencies with this two-stage novel system was 83.6%, 40%, 76.81% , 90.6% for COD, BOD_5, TS and color, respectively. In addition, nZVI + H_2O_2 process in the second stage of treatment can be applied for landfill leachate because it can augment the BOD_5/COD ratio and increase the biodegrability of this type of wastewater.

Keywords: Leachate; Treatment; Carbon nano-tube; nZVI; H_2O_2

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