Landfill leachate treatment by a coagulation–flocculation process: effect of the introduction order of the reagents

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ABSTRACT

The physicochemical process of coagulation–flocculation was highly effective and economically suitable for leachate treatment. The leachate is characterized by a high chemical oxygen demand (COD), between 2,153 and 2,707 mg/L. The organic matter was not easily biodegradable (BOD5/COD: 0.2–0.135). Metal concentrations ranged between 0.1 and 4.2 mg/L for Cr, 0.005–0.04 mg/L for Cd, and 0.3–0.8 mg/L for Pb. The formation of sludge and its aptitude for decantation were measured. Several parameters were selected to check the purification of the landfill leachate, and these include turbidity, COD, metals, and sludge volume. Treatment with FeCl3 proved to be effective at pH 6.5, and for Al2(SO4)3 the optimal pH was 5.3. The results indicate that coagulation–flocculation by FeCl3 and Al2(SO4)3 is very effective in the reduction of turbidity, with abatement reaching 95 and 98%, respectively. For COD, removal by FeCl3 and Al2(SO4)3 reached 67 and 60%, respectively, at optimal concentrations of 18.5 mmol/L Fe3+ and 5.82 mmol/L Al3+. Aluminum sulfate produced less sludge than ferric chloride. The volume of sludge produced by FeCl3 remained around 800 ml/L, while the volume of sludge produced by the aluminum sulfate was 230 ml/L.

Keywords: Coagulation; Flocculation; Landfill leachate; Solid waste

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