

SETTLEMENT EVALUATION OF MUNICIPAL SOLID WASTE CONFINED IN LYSIMETERS CONSIDERING THE PHASES OF ANAEROBIC BIODEGRADATION

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Abstract

This research evaluated the settlements occurring in the municipal solid waste mass, confined in three lysimeters, considering the influence of the biodegradation of these wastes, by physicochemical characterization of the leachate produced. The physicochemical variables studied were: Chemical Oxygen Demand (COD), Nitrogen-Ammonia, Hydrogen Potential (pH), Volatile Fatty Acids (VFA) and Total Alkalinity. The measured settlements were analyzed based on the biodegradation phases of the confined wastes. Currently, the MSW is in the methanogenic phase of anaerobic biodegradation.

Key words:

Municipal Solid Waste, Settlements, Leachate

Introduction

The monitoring of settlements of sanitary landfill is very important because they influence the stability, the rehabilitation of the landfill area after the closure of activities, the drainage of rainwater and biogas, the project of elevation, among others. On the other hand, the biodegradation process of the confined wastes influences the settlements. This process leads the generation of leachate and biogas generation. Thus, this research evaluated the settlements occurring in the MSW, confined in lysimeters, considering the influence of the biodegradation of these wastes, through the physicochemical characterization of the leachate produced. Three lysimeters (L4, L5 and L6) with a rectangular cross-section of 1.40 m by 1.43 m were considered. Each lysimeter was filled with approximately 3t of MSW. The specific weight of the RSU was 8.0 kN/m³. All the lysimeters had a) drainage and collection system of leachate; b) drainage and collection system of biogas; c) cover system; d) openings for waste collection; e) settling plates positioned in the middle and surface of the MSW mass, f) thermocouples to measure the internal temperature of the waste mass. Leachate samples were collected and submitted to physicochemical tests such as Chemical Oxygen Demand (COD), Nitrogen-Ammonia, Hydrogen Potential (pH), Volatile Fatty Acids (VFA) and Total Alkalinity. The settlement measures were carried out weekly and the leachate collection and physicochemical tests monthly.

Results and Discussion

The monitoring period of this research was between days 874 and 1021 of disposal of the MSW inside lysimeters, being the values before those dates measured by Moretto¹ (2018). There was a similar variation of L4, L5 and L6 settlements. The plates positioned in the middle of the mass of MSW settled 1.6cm in L4 and 1.3cm in L5 and L6. The plates placed on the surface of the mass of MSW, presented 2.2cm for L4, 1.9cm for L5 and 1.8cm for L6 of settlements. An average 30% higher of settlements for the plates positioned on the surface than for the half-depth plates was observed. Leachate analysis indicated that the MSW suffered all the biodegradation phases and is currently in the

methanogenic phase, which characterized by low and stable values of COD, Nitrogen-Ammonia, VFA and Total Alkalinity. Nonetheless, the pH values remain around 7.0. Settlements measured over the time of disposal of the MSW in the L5 lysimeter can be seen in Figure 1, which also shows the variation of the pH in the same monitoring period. The mean of the measurements measured in the middle and the mean of the settlements measured on the surface of the MSW mass were considered.

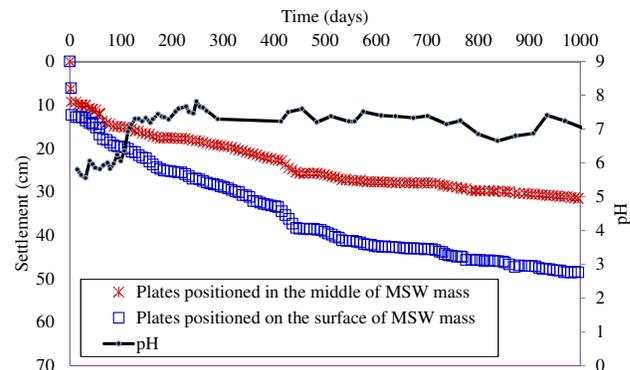


Figure 1. Settlements versus time and pH for L5

Conclusions

The monitoring of the settlements and the analysis of the physicochemical results of the leachate allowed to identify that the MSW confined in the three lysimeters is in the methanogenic phase of anaerobic biodegradation. The results obtained in the physical-chemical analysis of the leachate indicated low and stable values for COD, Nitrogen-ammonia, VFA and Total Alkalinity, and pH values around 7.0.

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¹ MORETTO, R.L. (2018). *Análise de Recalques do Resíduo Sólido Urbano Confinado em uma Célula Experimental e em Lisímetros, Considerando a Biodegradação*. Tese. Unicamp. 2018.