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Geoelectrical monitoring during waste biodegradation process

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Waste storage is the waste treatment method most commonly used around the world because it is a relatively simple and economical way for solid waste disposal (Erses et al., 2008). For this reason non-hazardous waste disposal facilities formerly operated as mere filling pits, nowadays are complex structures whose objective is to reduce environmental impacts and enhance biogas production. Waste storage industry professionals are currently interested in a spatializing method that could allow the characterization of solid waste biodegradation state in landfill. Geophysical methods have long been used on landfill for the location of pollution plumes, the mapping of internal and external structures, or more recently for the study of leachate recirculation process. The transformation of solid waste into biogas carried out by all microbial populations brought into play during the anaerobic digestion, involves changes in the physicochemical parameters of the medium. Indeed porosity, leachate conductivity, microbial growth, for example will be changed during the waste biodegradation cycle. This is those changes in the physical and chemical properties of the waste that could be detected by geophysical methods. For these reasons four geophysical methods have been chosen to become an indicator of the biodegradation waste state on landfill:

(i) Self-potential,
(ii) Electrical resistivity,
(ii) Induced polarization,
(iii) Spectral induced polarization

In order to evaluate the potential and limits of the chosen geophysical methods an experimental device have been build allowing us to study the influence of the different steps of waste biodegradation on measurements of the four methods. Municipal solid waste have been shred, poured in a laboratory column and moistened with biowaste digestate. The cell was then saturated with water and placed at 35° C in order to increase the biodegradation kinetic. Monitoring of the four geophysical methods as well as the cell gas production and composition is carried out since early September and will allowing us to determine the relevance of the geoelectrical methods to characterize a waste biodegradation state.