

COMPOST PILES MONITORING WITH GC-MS, E-NOSE AND OLFACTOMETRY: COMPARISON OF THE DIFFERENT APPROACHES

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In major cases, odours emitted by municipal solid waste (MSW) plants induce annoyance on the surrounding population. However, regulation and controls are difficult to determine. The complexity of the emissions and the subjectivity of the odour perception can partially explain this lack. Another concern is the use of various measurement techniques that are not standardised. This paper proposes a comparison of complementary approaches to monitor the odours. The odour source selected for this study is green waste compost at different maturity stage. The study site is a composting facility, located in the south of Belgium.

A portable e-nose developed by the Environmental Monitoring Research Team was located in different places to monitor the odorous emissions from the piles. The sensor chamber consisted of humidity and temperature sensors and six metal oxide sensors from FigaroTM (TGS2610, TGS822, TGS2620, TGS842, TGS2180, and TGS880). The device is battery powered and a pump sucked the odour through the sensor chamber with a flow of 150 ml/min for 30 min. Simultaneously to the in-situ e-nose measurements, the volatile organic compounds were collected on TenaxTM cartridges for 30 min. with a flow rate of 150 ml/min. Chemical analyses were performed in the laboratory by a TD-GC-MS (Thermo).

In addition, at the same time, odours were sampled in Tedlar bags and analysed in the laboratory, few hours after the sampling with the same e-nose. The aim was to compare the sensitive range of the sensors in situ and in the laboratory. For e-nose measurement in the laboratory, odourless reference air was used. This air was collected on the field, about 500 meters upwind the compost piles, at the same time the odour sampling was realized. For each sample, a second bag was also analysed by olfactometry according to the EN 13725 standard to determine the odour concentration (OU_E/m^3) with the Odile olfactometer (Odotech, Canada).

Finally, some parameters of the composting process like compost temperature and date of aeration have been considered to assess its maturity.

The large data sets were explored by statistical methods such as Principal Component Analysis (PCA). The olfactometry indicates an increase of the odour concentration during the first days of the degradation process (1). Most of the chemical families are terpenes, organic acids, ketones, aldehydes and alcohols like D-Limonene, Butanoic acid, Thujone, Hexanal and 2-Butanol, respectively. E-nose data are linked to the chemical composition and to the odour concentration. These preliminary results highlight the possibilities of monitoring the composting process as well as the released odours with simple measurement approaches.

REFERENCES

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