Monitoring of volatile compound emissions during dry anaerobic digestion of the Organic Fraction of Municipal Solid Waste by Proton Transfer Reaction Time-of-Flight Mass Spectrometry

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HIGHLIGHTS

- The first application of PTR-ToF-MS in bioresource technology is presented.
- Non-invasive monitoring of VOCs produced by anaerobic digestion of OFMSW.
- Rapid monitoring of many peaks provides quantitative and qualitative information.
- Data provide insight into the underlying processes occurring during digestion.
- Relevant information in view of SOFC applications are presented.

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ABSTRACT

Volatile Organic Compounds (VOCs) formed during anaerobic digestion of aerobically pre-treated Organic Fraction of Municipal Solid Waste (OFMSW), have been monitored over a 30 day period by a direct injection mass spectrometric technique: Proton Transfer Reaction Time-of-Flight Mass Spectrometry (PTR-ToF-MS). Most of the tentatively identified compounds exhibited a double-peaked emission pattern which is probably the combined result from the volatilization or oxidation of the biomass-inherited organic compounds and the microbial degradation of organic substrates. Of the sulfur compounds, hydrogen sulfide had the highest accumulative production. Alkylthiols were the predominant sulfur organic compounds, reaching their maximum levels during the last stage of the process. H2S formation seems to be influenced by the metabolic reactions that the sulfur organic compounds undergo, such as a methanogenesis induced mechanism i.e. an amino acid degradation/sulfate reduction. Comparison of different batches indicates that PTR-ToF-MS is a suitable tool providing information for rapid in situ bioprocess monitoring.

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