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Qualitative Characterization and Differentiation of Digestates from Different Biowastes Using FTIR and Fluorescence Spectroscopies

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ABSTRACT

Anaerobic digestion of biomasses originates different products, the most abundant of which are methane and carbon dioxide. During this process, a 60-70% organic matter reduction occurs and the final product, the digestate, is characterized by high biological stability and high contents of recalcitrant organic molecules and nutrients. In the present work digestates obtained by different mixture of biomasses in a full-scale co-digestion plant operating in Italy were characterized as whole samples without any pre-treatment or extraction by means of Fourier transform infrared spectroscopy and fluorescence spectroscopy in the synchronous-scan mode and results were compared to those obtained on the single fresh substrates. Biomasses considered were: beef cattle slurry, maize or sorghum silage, agro-industrial residues, olive residues and olive mill wastewater. These substrates exhibited typical spectra related to their different chemical composition. Results obtained on digestates provided evidence of distinctive characteristic of the final product as a function of the different composition of the biomasses loaded into the digestion plant. We concluded that FTIR and fluorescence spectra of digestates produced in a real co-digestion plant "inherit" the main spectroscopic features of the organic wastes from which they are produced. Spectroscopic techniques used in this work succeeded in qualitatively characterizing and differentiating digestates obtained from biomasses of different chemical composition.

KEYWORDS

Organic Wastes, Anaerobic Digestion, Digestates, Fourier Transform Infrared Spectroscopy, Synchronous-Scan Fluorescence Spectra

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