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Different pathways of resource recovery from anaerobic digestion of organic residues

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Anaerobic digestion is a key process for urban solid waste management converting organic waste into biogas, mainly composed of methane and carbon dioxide, and a residue called digestate which is generally separated into solid and liquid fractions.

Based on an overview of the abundant literature published on municipal solid waste and lignocellulosic biomasses, the potentialities of anaerobic digestion processes will be presented. The first part of the lecture will discuss the interest of using pretreatment techniques to improve the conversion of wastes into biogas [1,2]. Some intermediary products of anaerobic digestion such as fatty acids, ethanol and hydrogen present a higher added value than methane. Different anaerobic process parameters and the selection of specific microbial consortia allow an optimal production of these products while preventing methane production in the so-called dark fermentation process [3]. The impact of waste pretreatment on the production of hydrogen and metabolites will also be discussed [1]. Dark fermentation effluents may be treated in anaerobic digestion to produce biohydrogen, consisting of a mixture of biohydrogen and methane, and leading a cleaner and more efficient combustion than that of methane alone.

In addition, digestates are rich in nitrogen, phosphorous and more or less stabilized carbon and can be used as fertilizers or soil improvers. More original uses of digestates have been proposed such as the conversion of the digestate solid fraction into activated biochar, bio-oil and syngas through thermal processes, or the use of nutrients present in the liquid fraction in biological processes such as algae growth or bioethanol production [4].

References

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