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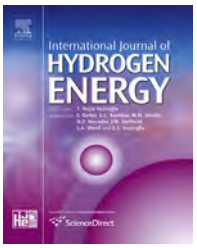

Biohydrogen from food waste in a discontinuous process: Effect of HRT and microbial community analysis

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ABSTRACT

There are several parameters that affect the hydrogen (H_2) production when using organic solid waste in a discontinuous process, such as the hydraulic retention time (HRT). To optimize the process, it is necessary to determine the HRT such that the H_2 production is maximized. The objective of this study is to evaluate the effect of different HRTs on the hydrogen production in an anaerobic sequencing batch reactor (ASBR) using food waste as the substrate. The microbial community was analyzed and correlated with the reactor performance. The results showed that the highest percentage of H_2 in biogas, maximum volumetric H_2 production, and maximum H_2 production rate was obtained with an HRT of 24 h. The percentage of H_2 in biogas varied from 22 to 53%, which depended on the HRT. Acetic acid was the main volatile fatty acid obtained. The highest propionic acid production was observed with an HRT of 6 h, which was related to a decrease in H_2 generation, where a low diversity and low evenness were obtained compared with those of the reactor samples obtained from different HRTs. The genus *Megasphaera* was found to be the dominant genus in the microbial community.

Introduction

Hydrogen (H_2) is considered to be an energy vector that has a high heating value of 285.8 kJ/mol and a maximum electricity production of 237.2 kJ/mol (produced by a fuel cell) [1]. Hydrogen can be stored as a fuel and used in transportation and distributed heat and power generation using fuel cells, internal combustion engines, or turbines with only water as a subproduct [2]. It is possible to produce H_2 from organic waste, biomass, and/or wastewater through dark fermentation using microorganisms, which has proven to be a relatively simple, inexpensive process [3]. One type of waste that can be used in hydrogen production is the food waste derived from restaurants, food processing industries, etc [4]. This residue represents an environmental problem, particularly in large cities where the typical method of disposal is landfills. Food waste is primarily composed of carbohydrates (abundant amounts cellulose and starch), lipids and proteins; all of these complex polymers are useful for fermentation. Therefore, it is possible

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