Potential of biohydrogen production from organic fraction of municipal solid waste (OFMSW) using pilot-scale dry anaerobic reactor

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Potential of biohydrogen production from organic fraction of municipal solid waste (OFMSW) using pilot-scale dry anaerobic reactor

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Abstract

A long-term evaluation of a mesophilic up-flow intermittently stirred tank reactor (UISTR) for hydrogen production from the organic fraction of municipal solid waste was investigated. UISTR was operated at five different hydraulic retention times (HRTs) of 10, 7.5, 5, 3 and 2 days. This corresponds to organic loading rates (OLRs) of 18.1, 26.2, 41.3, 61.0, and 97.2 g_{COD}/L/day, respectively. The highest volumetric H_2 production of 2.20 ± 0.19 L/L/d and H_2 yield of 2.05 ± 0.33 $mol_{H2}/mol_{Carbohydrate}$ were achieved at HRT of 3 days and OLR of 61.0 g_{COD}/L/day. This revealed a higher sCOD/tCOD ratio of 0.46 ± 0.08 and a lower particle size diameter of 307.6 µm in the digestate, with a reduction of 72.0%. The maximum carbohydrates, proteins, and lipids conversions amounted to 68.2 ± 13.0%, 37.5 ± 6.7% and 48.6 ± 4 .7%, respectively recorded at HRT of 10 days and OLR of 18.1 g_{COD}/L/day.

Keywords: Dry anaerobic digestion; Organic fractions of municipal solid waste; Up-flow intermittently stirred tank reactor; Particle size distribution

1. Introduction

Fossil fuels still dominate energy consumption (approximately 86%), as well as being the major source of greenhouse gas (GHG), which results in environmental problems,

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