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Topic: Biological hydrogen and methane production from lignocellulosic feedstocks for natural gas grid injection.

Abstract:

Production of hydrogen ( $H_2$ ) and methane ( $CH_4$ ) has been recently investigated in two-stage biological processes using various lignocellulosic substrates. The two-stage  $H_2/CH_4$  process presents several advantages compared to the conventional one stage  $H_2$  or  $CH_4$  process since it leads to the selection and enrichment of specific and different microbial consortia in each stage, resulting in a better overall process stability. In the first stage, low pH and short hydraulic retention times, (HRTs) are maintained in order to favour the fermentation of lignocellulosic residues into hydrogen and volatile fatty acids (VFAs) by enhancing the growth of  $H_2$ -producing bacteria. These bacteria are less sensitive to substrate fluctuations than methanogens. In the second stage, neutral pH and longer HRTs are maintained to develop the growth of acetogens and methanogens for further conversion of VFAs to methane and carbon dioxide. This methanogenic process is very sensitive to pH changes, VFA accumulation, and organic loading rates. Moreover, the two-stage  $H_2/CH_4$  can have a positive effect on methane production compared to one-stage  $CH_4$  by enhancing the hydrolysis of lignocellulosic residues in the acidogenic  $H_2$  stage.