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Effect of pH and Fermentation Time on the Biohydrogen Production from Sugar Cane Molasse

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Abstract

Biohydrogen is one of promising alternative renewable energy sources. This can be produced through sugar fermentation in anaerobic condition. In this research, the potential of biohydrogen production from molasse using cow dung as inoculums is investigated. The biohydrogen was produced through fermentation of molasse in serum vials at varied initial pH (3, 5, 7) and fermentation (2, 3, and 4 days). The cow dung was preheated at 105^{o}C and 2 hours prior to inoculation. The final sugar concentration, MLVSS, volatile fatty acids (VFAs), alcohol content (ethanol and butanol) as well as the gas production rate were analyzed at the end of fermentation. The presence of *Clostridiumperfringens* in the inoculums had been detected. The highest biohydrogen yield was 3.065 mole H_2/mole of substrate. The potential of the biohydrogen produced to produce electricity was tested using fuel cell. It was found that it can produce 11.477 W.

Keywords: biohydrogen, molasse, fermentation, cow dung

Introduction

The problem of the declining fossil fuel, increasing fuel demand and hence its price has gained lots of attention currently. Moreover, fossil fuel burning leaves environmental and health problems. Many efforts have been done to seek several alternative energy sources which are clean and renewable. Hydrogen is a promising energy carrier for the future. It is a clean fuel which only produces water upon combustionor via fuel cell (Leung et al., 2006, Xing et al., 2010, Besancon etal., 2011, Claassen et al, 1999). The energy released from hydrogen combustion is also large, i.e. 143 GJ/tone (Basak and Das, 2009).

Conventionally hydrogen is produced through physicochemical process. However, this is costly and energy intensive (Chen etal., 2008). Hence, technologies for hydrogen production which are safer, sustainable and efficient are demanded.Biohydrogen is hydrogen produced through biological process. These also include ones which utilize waste or biomass as a substrate or inoculums. The biomass includes manure, municipal solid waste and residue from forest and agriculture (Vasques, et al. 2008).Biohydrogen can be produced through several methods such as direct biophotolysis, photo-fermentation, indirect biophotolysis,