

Hydrogen Production from Solid Waste of Sago Processing Industries in Indonesia: Effect of Chemical and Biological Pretreatment

Authors : Pratikno Hidayat, Khamdan Cahyari

Abstract : Hydrogen is the ultimate choice of energy carriers in future. It contains high energy density (42 kJ/g), emits only water vapor during combustion and has high energy conversion up to 50% in fuel cell application. One of the promising methods to produce hydrogen is from organic waste through dark fermentation method. It utilizes sugar-rich organic waste as substrate and hydrogen-producing microorganisms to generate the hydrogen. Solid waste of sago processing industries in Indonesia is one of the promising raw materials for both producing biofuel hydrogen and mitigating the environmental impact due to the waste disposal. This research was meant to investigate the effect of chemical and biological pretreatment i.e. acid treatment and mushroom cultivation toward lignocellulosic waste of these sago industries. Chemical pretreatment was conducted through exposing the waste into acid condition using sulfuric acid (H₂SO₄) (various molar i.e. 0.2, 0.3, and 0.4 M and various duration of exposure i.e. 30, 60 and 90 minutes). Meanwhile, biological treatment was conducted through utilization of the solid waste as growth media of mushroom (Oyster and Ling-zhi) for 3 months. Dark fermentation was conducted at pH 5.0, temperature 27°C and atmospheric pressure. It was noticed that chemical and biological pretreatment could improve hydrogen yield with the highest yield at 3.8 ml/g VS (31%v H₂). The hydrogen production was successfully performed to generate high percentage of hydrogen, although the yield was still low. This result indicated that the explosion of acid chemical and biological method might need to be extended to improve degradability of the solid waste. However, high percentage of hydrogen was resulted from proper pretreatment of residual sludge of biogas plant to generate hydrogen-producing inoculum.

Keywords : hydrogen, sago waste, chemical, biological, dark fermentation, Indonesia

Conference Title : ICBB 2016 : International Conference on Biotechnology and Bioengineering

Conference Location : Jeddah, Saudi Arabia

Conference Dates : January 26-27, 2016