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Clean energy: Hydrogen production from glycerol via dark fermentation

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Abstract

The demand for renewable and clean energy supplies is increasing because of depleting fossil fuels and global warming. Hydrogen (H_2) is the only carbon-free energy source which is regarded as the cleanest fuel since water is the only product during combustion. Bio-hydrogen (bio- H_2) production is promising because many organic wastes can be utilized as feedstocks. Bacteria fermentation, a similar process taking place during food digestion in our gut system, can be utilized to produce bio- H_2 .

Glycerol, a waste byproduct from the manufacture of biodiesel, is a low-value chemical that can be converted into H_2 . Biodiesel is a transportation fuel produced which is from algae. Converting glycerol into H_2 could be an economic advantage for many biodiesel industries. Adding fatty acids which are produced from oils such as safflower and sunflower oils can improve H_2 production from glycerol during bacterial fermentation. Although bio- H_2 production from glycerol through dark fermentation by using selected bacterium has been reported, the performance of H_2 yield needs to be analyzed when mixed bacteria and H_2 -improving treatment are conducted. The main objective of this work was to establish a maximum H_2 yield during the glycerol fermentation in the mixed cultures with the presence of fatty acids.

Keywords: Renewable energy; Bio-hydrogen production; Bacteria fermentation.