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Nourishment Essential Requirement for Bio-Hydrogen Production in Anaerobic Condition

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Whereas quantity of fossil fuels is limited, Large-scale production of hydrogen is a necessity for the world. It is concluded that hydrogen is the most promising option in the succession of fuel evolution. Combustion of hydrogen results lower NOx emissions (more than 57-73%) from internal combustion engines, which is environmentally more desirable [1]. It does not produce greenhouse gases; instead it has a high energy yield (142 kj/g) which is 2.75 times more than that of any fuel. Compared with alternative technology, namely hydrogen production from fossil fuels, biomass and water using chemical, biological process generate large quantities of hydrogen; however, the operation is to some extent difficult. Among biological H_2 production processes such as (photosynthetic hydrogen production and fermentative hydrogen production), the fermentative production has been considered as a viable and effective method. In general, it has some significant advantages compared to photosynthetic hydrogen production and produces hydrogen continuously without light using various kinds of substrates, low cost and finally biogas (H_2) production. Therefore, fermentative hydrogen production has been received increasing attention in recent years [2-5]. Hydrogen production via fermentation involves facultative or anaerobic bacteria. Microbiological treatment processes require nutrients such as organic substrates, a source of carbon and energy, to sustain growth and to carry out biochemical transformations. Additionally, higher hydrogen yields will most probably be achieved through adding proper nutrients, thereby enhancing catabolic processes [6]. The various nutrients that may establish can either be promoted or inhibited, depending on the adopted operating conditions. To this regard, operational parameters including substrate concentration, temperature, reactor configuration, pH and organic loading rate should be the subject for optimization of process efficiency. These processes are undertaken via different anaerobic bacteria. The characteristics of these microorganisms widely differ from each other with respect to substrates and process conditions. However, there are several high potential bacteria for

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hydrogen production that nutritional requirement of this bacteria depends on the type of bacteria and experimental conditions [7]. The list of microbial community of interest includes facultative anaerobe species (*Enterobacter aerogenes*, *Enterobacter cloacae IIT-BT 08*) and obligate anaerobe species (*Clostridium butyricum*, *Citrobacter spY19*, *Bacillus coagulans* and *Clostridium acetobutylicum ATCC 824*) [8-13]. Among microbial community, the Gram-positive bacteria of the Clostridium genus are promising, since it has a natural high hydrogen production rate. In addition, it is fast growing and capable of forming endospores, which makes the bacteria easy to handle in industrial application.

At this time, hydrogen production and its use as a fuel are of great significance. Therefore, because of hydrogen yields depended on the nutrient requirement to the bacterial community of Hydrogen production, it is necessary to recognize the most optimal rate of nutrient on operation.

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