

TITLE: HYDROGEN PRODUCTION FROM ENZYMATIC PRETREATED CELLULOSE BY *Clostridium butyricum* IN ANAEROBIC BATCH REACTORS

AUTHORS: STANCARI; R.A.; BRAGA; J.K.; VARESCHE, M.B.A.

INSTITUTION: DEPARTMENT OF HYDRAULICS AND SANITATION EESC/USP SÃO CARLOS, SP, BRAZIL (AV. TRABALHADOR SÃOCARLENSE, 400, 13566-590)

ABSTRACT:

The problems inherent to the scarcity of fossil fuels and their polluting potential led the development of new resources of energy and the utilization of lignocellulosic wastes is a viable alternative. Those possess a highly resistant structural constitution which need a pre-treatment process to allow access of hydrological enzymes during the biological activity. This way, the aim of this study was to evaluate the viability of extraction the cellulolytic complex produced by *Aspergillus niger* and optimize its applicability as a biological pretreatment of cellulose aiming biological hydrogen production by *Clostridium butyricum*. The methodology applied in this study consisted of: Stage 1 - enzymatic hydrolysis of cellulose in solid state fermentation applying *A. niger* in different temperatures (28°C, 37°C e 45°C) to optimize the production of the enzymatic complex and Stage 2 – Hydrogen production by *C. butyricum* using cellulose (2 g/L) enzymatically pretreated (the best condition from Stage 1) in anaerobic batch reactors and using cellulose (2 g/L) without pretreatment, as control. The H₂ assays were conducted in batch reactors in mesophilic condition. It was possible to conclude that *A. niger* produces the desired enzymatic complex and its production is optimized (24.4 FPU/mL) under 37°C after 24 hours of incubation. The higher H₂ production (6.6 mmol/L) was obtained after 30 hours of incubation when the cellulolytic complex was applied in the cellulose pretreatment. In the reactors without cellulose pretreatment the H₂ production took longer than the previous condition (5.7 mmol/L after 51 hours of incubation). Therefore, the use of the enzymatic complex obtained from *A. niger* was feasible in the optimization of H₂ production by *C. butyricum*, since higher H₂ production was achieved in a shorter incubation time.

Keywords: FPU, enzymatic pretreatment, cellulase.

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