MICROBIAL COMMUNITY STRUCTURE OF BIOHYDROGEN PRODUCTION PROCESS IN EXTREME THERMOPHILIC CONDITIONS

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Background: Anaerobic dark fermentation is a promising and environmental friendly method to produce H_2 from wastewater (1). Extreme-thermophilic environments are thermodynamically favourable for H_2 production by dark fermentation (2).

Objectives: To get insight into the structure of the microbial communities involved in H_2 production under extreme-thermophilic conditions.

Methods: Sludge samples were collected from two EGSB reactors operating at 70±1ºC, pH 5.5 and fed with a mixture of glucose and arabinose. Heat treated methanogenic granules (HTG) and engineered heat treated methanogenic granules (EHTG) were individually inoculated in each reactor. EHTG were obtained by surface attachment immobilized-cell technique with an enriched H2-producing culture, using HTG as carriers. Microbial community analysis was performed by 16S rRNA-based techniques (PCR-DGGE).

Results: Bacterial diversity (measured as the number of bands) was higher in the EHTG system than in the one operated with HTG. Bands with the same migration distance as the ones detected in the enriched culture profile were found in the EHTG band-pattern, evidencing a good immobilization and maintenance during the trial period. The EHTG reactor showed efficient H_2 production, achieving a maximum rate of 2.5L H_2 $L^{-1}d^{-1}$ in steady state, whereas in HTG a transient H_2 production was observed, exhibiting two maximum peaks of 0.8 and 1.5L H_2 $L^{-1}d^{-1}$.

Conclusions: The results evidence the potential of using immobilization-cell technique to construct efficient hydrogen-producing granules.

References:

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