

Evaluation of Different Support Materials used with a Photo-Fermentative Consortium for Hydrogen Production

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ABSTRACT

Four different support materials were evaluated for immobilization of a consortium of purpur non-sulfur bacteria (PNS) producing hydrogen gas. The inoculum was enriched from a microbial fuel cells. Tested materials were acrylic bars, silica gel, high-density polyethylene cylinders and luffa (dispersed fibers and cubes). The area/volume ratio, volatile solids per area and the amount of hydrogen produced using volatile fatty acids as substrate were determined. The experiments were conducted in serological bottles of 120 mL, continuously illuminated at 7 kilolux, mixed at 100 rpm and 32 °C. It was found that the PNS bacteria generated $16.7 \pm 2.6 \text{ mLH}_2/\text{gVS}\cdot\text{h}$. The highest biomass quantity (as volatile solids, VS) was found in dispersed luffa fibers ($8.0 \pm 1.7 \text{ mgVS}/\text{cm}^3$) followed by luffa in cubes, high-density polyethylene cylinders and acrylic bars. Dispersed luffa allowed a better light distribution and contact with the media than luffa in cubes. Silica gel was not suitable for the immobilization and hydrogen production. Experiments with the colonized supports indicated that no significant differences regarding specific hydrogen production were observed among luffa, acrylic bars and polyethylene. In conclusion the luffa in the form of fibers is a suitable support for purpur non-sulfur consortium because of this provide the highest area/volume ratio and the highest attached quantity of VS per volume. After several batches the biomass remained attached to the support.

Keywords: Hydrogen, cell immobilization, photo-fermentation

