BUTANOL PRODUCTION BY *CLOSTRIDIUM ACETOBUTYLICUM* IN A SERIES OF PACKED BIOFILM BED REACTORS

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The reactor design plays a key role in the fermentative production of biobutanol. The high cell concentration that may be reached in confined – biofilm, membrane, recycling - cell reactors offers high conversion rates. To the authors knowledge, the concentration of solvents in the broth from biofilm reactors reported in literature is not particularly high and it negatively affects the successive stages for butanol recovery. The low concentration of solvents in the produced stream is typically due to the inhibitory effect of solvents on the fermentation. Therefore, the butanol bioreactor productivity is as low as the bioreactor behaviour approaches the CSTR limit. The aim of this contribution is to report recent results on the design of a continuous biofilm reactor to optimize the process performances.

Clostridium acetobutylicum DSM 792 was adopted for the fermentation process. The conversion was carried out in 4 packed bed reactors (PBRs) connected in series: the first reactor of the series was kept under acidogenesis and the successive reactors were kept under solventogenesis. Tests were carried out feeding the reactor system with solutions bearing glucose.

Each PBR was a 4 cm ID, 16 cm high glass tube with a 8 cm bed of 3 mm Tygon rings, as carriers. The system was operated at the dilution rate set between 0.15 h^{-1} and 0.7 h^{-1}.

The fermentation process was characterized in terms of metabolite concentration (butyric and acetic acids, ethanol, butanol, acetone), and sugar conversion measured in each reactor.

The PBRs fed with glucose (100 g/L) as carbon source and operated under optimized conditions was characterized by: butanol productivity 9.43 g/Lh, butanol concentration 14.5 g/L, butanol selectivity with respect to all solvents 69%w.