A new fermentation reactor system equipped with a spin filter to enhance the bacterial cellulose production

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Abstract

Because of the unique properties of bacterial cellulose (BC) it has been used in the production of high performance speaker diaphragms, tourniquets, diet food, artificial skin, medical pads, make-up pads, and paint thickeners. BC has been produced traditionally by static culture that has a low productivity, because a shear stress in the shaking culture converts microbial strains into non-cellulose-producing (*Cel-*) mutants during cultivation, resulting in the decreased BC production1. Our previous reports on the BC production showed that cellular activity could be preserved without occurrence of *Cel-* mutants in consecutive shake-cultures. However, in agitated culture conditions, a number of cellulose-producing (*Cel+*) cells were converted into *Cel-* mutants[2].

To overcome the problems associated with the conventional fermenters and to improve the BC production, a new fermentation system, using a spin filter, was developed and tested under various experimental conditions. The spin filter, a cylinder typesurrounded by a stainless steel mesh and the bottom consisted of stainless steel plate, was attached to the agitator shaft. This newly developed fermentation assembly was tested using 5 L and 2 L fermenters equipped with a 6 flat-blade turbine impeller for BC production by *G. hansenii* PJK at various pH and agitation rates. With this system we were able to remove a fair amount (~50%) of the exhausted culture broth from the fermenter and replaced with the fresh medium at different time intervals. Experiments with the periodical recycle of culture broth supplemented with glucose and ethanol were also carried out. In this fermentation system, the live cells population remained nearly constant during

the course of cultivation time leading to the over all improvement of production yields of BC. It was also found that the population of *Cel-* mutants decreased with increase in the impeller speed. Similarly, the number of *Cel-* mutants was also found to be related to the pH of the broth used. The results obtained will be presented in terms of the feasibility for the scale up of this new fermentation system for the BC production on industrial level.

References

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