PUSHING PRODUCTIVITIES IN BIOBUTANOL PRODUCTION THROUGH INTEGRATION WITH PERVAPORATION

H. De Wever, W. Van Hecke - VITO

B. Owoh, E.T. Davies - Green Biologics

CHALLENGES OF BUTANOL FERMENTATION

The production of *n*-butanol with clostridial strains, known as ABE (acetone-butanol-ethanol) fermentation suffers from product inhibition, leading to low solvent titers and low productivities. An alleviation of product inhibition can be achieved by complementing the fermentation process with *in situ* product recovery (ISPR) technology. Our ISPR approach consists of integrating organophilic pervaporation membranes to selectively remove the solvents.

EXPERIMENTAL SET-UP

- > 1-stage or 2-stage fermentation on glucose or glucose-xylose mixture
- > Fermentor volume range: 2 to 7 L
- > Fed-batch or continuous operation
- > Direct coupling to organophilic pervaporation without intermediate cell removal step
- > Continuous selective solvent removal from fermentation medium

RESULTS FOR 2-STAGE PROCESS

- > **Productivity:** increased with factor 2.5 due to continuous operation and alleviation of product toxicity
- > **Robustness:** integrated set-up operated for 475h without any sign of membrane fouling
- > **Water footprint:** halved by doubling the carbohydrate concentration in the feed

References

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CONTACT:

heleen.deweever@vito.be

RESULTS FOR 1-STAGE PROCESS

- > Simultaneous consumption of glucose and xylose
- > The use of different pervaporation membranes allowed to double fluxes to 1000 kg/m².h while maintaining high solvent enrichment in pervaporation condensate (> 200 g/kg).
- > Continuous operation of a single-stage set-up allowed to reach productivities of 0.97 g/L.h, well above the target of 0.75 g/L.h.
- > These achievements further improve the economic case for ISPR.
- > Further work will focus on the use of 2^o generation feedstocks and demonstration of the process at pilot scale.

<http://www.butanext.eu>

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BENEFITS

Increased production x 2.5

Fermentor cost ↓

Water footprint - 50%

Steam consumption - 50%

Applicable in batch, fed-batch & continuous processes

Production price - 10%