**Optimizing specific uptake rates of butyric and acetic acid for continuous bioconversion to butanol with *C. saccharoperbutylacetonicum*.**

Florian Gattermayr1, 2, Viktoria Leitner1, Christoph Herwig2

*1 Wood K plus – Kompetenzzentrum Holz GmbH, Altenberger Strasse 69, Linz, Austria; 2 Vienna University of Technology, Institute of Chemical Engineering, Getreidemarkt 9/166, Vienna, Austria*

*\*Corresponding author: f.gattermayr@wood-kplus.at*

**Highlights**

* Continuous conversion of organic acids to solvents
* Minimized loss of glucose in effluent
* Optimized bioprocess for maximum specific uptake rates of organic acids

**1. Introduction**

Emerging technologies are sought to utilize a multi-feedstock biorefinery process to efficiently convert industrially based lignocellulosic waste streams, such as black liquors or hydrolysates, into high value-added chemicals such as butanol. However, the use of those feedstocks is due to their volatile composition and quality quite challenging.

**2. Goal**

As initial conversion step of those feedstocks we use the ‘carboxylate platform’ to produce organic acids which are then supplied to a bioreactor for the production of solvents with solventogenic clostridia. Thereby the ratio and total concentration of those acids as well as the pH are known to significantly affect their uptake rate and thus subsequently the production of solvents [1, 2]. For the prolonged and efficient conversion of waste streams to butanol it is crucial to optimize the bioprocess for high specific uptake rates of organic acids.

**3. Methods**

The organism *C.* *saccharoperbutylacetonicum* was grown on a modified Clostridial Growth Medium (CGM). Fermentations are carried out on a parallel bioreactor system (Eppendorf DASGIP) controlled at 30 °C, stirred at 100 rpm and constantly purged with 5 L h‑1 of sterile N2 to maintain anaerobic conditions as well as to monitor the production of CO2 and H2 with a Micro GC Gas Analyzer (Inficon). Samples are frequently collected from the reactor for HPLC analysis (Shimadzu), determination of the cell dry weight (CDW) and measurement of the optical density (OD).

**4. Results and discussion**

Previously, we demonstrated the successful uptake of supplied butyric and acetic acid and their conversion to solvents in batch and fed-batch fermentations. We also could confirm that glucose has to be present in the medium for this conversion to function, as it serves both as source of ATP and electrons for the conversion of butyric acid to butanol as well as carbon source for biomass growth [3]. In this work, we aim to operate a continuous fermentation. As we only want to use glucose, which is necessary for the conversion of acids, the concentration of glucose in the reactor will be kept in a limiting state by applying a pH controlled feeding strategy. With this system, we additionally also minimize the loss of unmetabolized glucose via the effluent stream. Finally, this will ensure an efficient consumption of substrate while maintaining a high uptake rate of fed organic acids for the continuous conversion to solvents.

**5. Conclusions**

We aim to demonstrate the continuous uptake of butyric and acetic acid and their conversion to solvents. The gained knowledge from this work is a first and important step towards establishing long term stable conversion of volatile lignocellulosic waste streams to butanol for next generation biorefineries.

**References**

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