Synechocystis biofilms as solar driven biocatalysts

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In the course of the debate regarding fossil carbon and energy, a lot of research is invested into the development of biological catalysts fuelled by sunlight, CO_2 and H_2O. Besides focussing on the biorefinery approach and maximizing biomass, photoautotrophic microbes are harnessed for directly producing a whole bunch of interesting compounds. However, low activities, low stabilities, and slow growth are problems these approaches are facing. Here we report on utilizing a biofilm based concept to realize a truly continuous bioprocess for the synthesis of 1,2-propane diol, as these microbial communities feature extraordinary robustness and permanent regeneration [1]. First fermentations have been conducted yielding final product titers of 4 mM 1,2-propane diol. Strikingly, the production of the 1,2-propane diol seemed to be clearly coupled to the stationary phase of the organism, as production started when cell growth ceased. Our findings indicate an uncoupling from cell growth and 1,2-propanediol synthesis. In addition, biofilms of *Synechocystis* sp. PCC 6803 seemed to stall growth at an optimal biofilm thickness of about 100 µm [2]. Thereby the reaction format of applying a phototroph as a catalytic biofilm for the generation of value added compounds fuelled by sunlight and CO_2 seem to be a perfect match for continuous solar driven catalysis.

References

[1] B. Halan et al, Trends Biotechnol. (2012) 30:453

[2] C. David et al, J Ind Microb Biotech (2015) 42:1083