

Characterization and engineering of Pseudomonas putida for aerobic n-butanol production



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Reviews

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(Lori Terry)

CHARACTERIZATION AND ENGINEERING OF PSEUDOMONAS PUTIDA FOR AEROBIC N-BUTANOL PRODUCTION

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Shaker Verlag Mai 2012, 2012. Buch. Book Condition: Neu. 21x14.8x cm. Neuware - Recent technological and economical developments reflect the general need for sustainable and cost-effective biotechnological processes for the production of high-volume, low-value bulk chemicals, some of which can be applied as 2nd generation biofuels. The latter, such as n-butanol, benefit from cheap and/or unconventional raw materials and improved product characteristics. To become ecologically and economically competitive, n-butanol biosynthesis requires engineering to overcome the main limitations: product toxicity and relatively low volumetric productivity. This thesis is based on a comprehensive literature review of n-butanol fermentations - including key fermentation performance parameters. Best performing processes are visualized using the window of operation methodology. Focusing n-butanol fermentation development from large-scale, highly diluted batch fermentations to integrated processes, the identified limitations were investigated in the following chapters. *Pseudomonas putida* was chosen as an alternative host for n-butanol biosynthesis to overcome the primary limitation of current producers - insufficient product titers due to low n-butanol tolerance. Indeed, *Pseudomonas* strains increased tolerance when exposed to n-butanol. Decreased energy production hints to changes that are low-energy demanding. Glycerophospholipids that are involved in membrane (re-)adjustments to environmental stresses were investigated. Challenged with sub-lethal concentrations of n-butanol, membranes of different *Pseudomonas* strains responded with changing glycerophospholipid compositions. With glucose as the main industrial carbon source, its catabolization by *Pseudomonas* was investigated. The results indicate simultaneous use of three convergent peripheral pathways that might enable energy and redox cofactor homeostasis and can be important for n-butanol biosynthesis. In this thesis, the design, synthesis and characterization of new n-butanol producers based on solvent-tolerant *Pseudomonas* strains are presented. Using *Escherichia coli* as control, expression vectors based on the *alkB* promoter system were designed to investigate n-butanol biosynthesis with simultaneous analysis of expression and enzymatic activities. Optimized DNA sequences...



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