Strain & Bioprocess Engineering Using 1st, 2nd, and 3rd Generation Feedstocks as a Pillar for Sustainable Bioeconomy

R. Takors,

Institute of Biochemical Engineering (IBVT), University of Stuttgart,

Allmandring 31, 70569 Stuttgart, Germany

We are living in an era of unprecedented human made climate change that is mainly caused by the release of fossil feedstock residues which accumulate in the atmosphere as greenhouse gases. At the same time, geopolitical changes disconnected the European chemical industry, in particular Germany, from long-term established gas and oil supply. Hence, alternative and sustainable solutions are heavily needed to turn our current economy into a circular economy making intensive use of local, renewable resources. Bioeconomy, i.e. the thorough exploitation of biotechnological potentials for installing the next generation of sustainable manufacturing processes, is expected to get a pillar of the current transition.

The presentation will exemplify current research of IBVT focusing on strain and bioprocess engineering using 1st, 2nd, and 3rd generation feedstocks. Applications will focus on *E. coli*, a microbial consortium of *Rhodococcus jostii* RHA1 and *Pseudomonas putida* KT2440 (Notheisen & Takors, *in press*), and on acetogens such as *Clostridium ljungdahlii*. Using said strains, production examples will be given for heterologous proteins, terpenoids, and pyridindicarboxylic acid (PDCA), a substitute for terephthalic acid. Besides, it will be shown how particularly robust *E. coli* strains for large scale application are engineered (Ziegler et al., 2021) to prevent non-wanted performance losses in industrial scale. Results will be complemented by simulation studies for predicting industrial scale performance, focusing on non-mechanically agitated bioreactors. Despite their intrinsic attraction, the latter rather represent niche applications in biotechnology so far.

Ziegler M, Zieringer J, Doring CL, Paul L, Schaal C, Takors R. 2021. *Metab Eng*. 67:75-87.