

## Biotechnological concepts for chemical and polymer production in the context of bioeconomy

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The talk will deal with novel biorefinery concepts to realize a biobased economy. Conversion of biomass into chemical monomers and polymers is in the focus.

A crucial difference between plant biomass and mineral oil lies in the quantity and locality of its availability. While mineral oil and its primary products can be transported through pipelines in great quantities without any problems and at little cost, plant products accumulate in smaller amounts across large areas. Transport across long distances is energetically expensive and does not pay off. The advantages of biotechnological processes are that they require comparatively simple facilities. This fact enables smaller industries to operate locally where the biomass accumulates e.g. as agricultural leftovers. We are working on different biorefinery concepts which will be realized in small- to mid-scale with modular set up, to react on changing substrate conditions as well as market demand for products.

An important technical issue is the purification of the products from diluted aqueous solutions that come when working with biomass and microbes. One solution here is the production of gases from intermediates. Outgassing from fermentation broth with following gas purification is much more greener, easier and energy saving than the separation of different liquid products. Another solution is to circumvent product-related toxicity on microbial cells by use of pure enzyme cascades. There are promising results of strain improvement for efficient gas fermentations and highly efficient enzyme cascades towards fine as well as bulk chemicals.

Another challenge is the direct production of green polymers such as microbial exopolysaccharides, which represent a valuable source of biogenic and biodegradable polymers with high functionalities. The use of genetic and metabolic engineering enables production of tailor made exopolysaccharides to be applied in specific technical applications of a biobased industry.