Sustainable and Efficient Production of Biopolymers from Industrial Waste Streams

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Form of Presantation

- ○ Poster
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Short Description (maximum 2500 characters)

PHAs are examples for microbial bioplastics with potential applications from packaging to medical materials. To be accepted by the customer, the price of a bioplastic for a defined application must be similar to the competing “classical” plastic. Normally, PHAs are produced on larger scale starting from costly carbon sources like sugars, resulting in prices significantly higher than for their petrochemical competitors. Economically, PHA production from sugars is extensively optimized. Further, diverting nutritionally important resources to bioplastics is ethically unacceptable. Applying waste streams which do not interfere with nutrition but constitute severe disposal problems is a promising approach to make PHAs competitive. The ANIMPOL project uses lipid waste streams from slaughtering and biodiesel industry, whereas the WHEYPOL project converted surplus whey from dairy industry. Whey constitutes a surplus material with annual amounts up to 1.4*108 t. Mainly in North America and Europe, huge quantities are available. It is produced in similar volumes to the milk processed in dairies resulting in increasing environmental concern. Lactose, the main carbon source in whey, can act as substrate for microbial growth and product formation in bio-processes. The conversion towards bioethanol, antibiotics, yeast extract, surfactants, single-cell protein, lactate, and PHA is reported. Additional waste to be upgraded to bio-resources accrues in animal processing industry. In Europe, amounts of surplus animal lipids from slaughterhouses are enumerated with about 5*105 t. They can be trans-esterified towards biodiesel (FAE) that consists of saturated and unsaturated components. The saturated FAE fraction that compromises FAE quality as fuel amounts to annually 5*104 t; this can yield about 3.5*104 t of PHA. Depending on the microbial production strain, different qualities for PHA can be produced from FAE, ranging from packaging materials similar to those accessible from whey lactose to resin-like polyesters with functional groups. As 2nd surplus product from FAE production, glycerol is available. If applied to cultivate microbial biomass, one can expect 0.4 - 0.5 g biomass per g glycerol. Techniques from various scientific fields are used to optimize PHA production from the discussed waste streams. The studies are supported by LCA & feasibility studies covering the use and the marketing of the products. The projects solve local

waste problems affecting the entire EU.