

Process Design and Evaluation of Biobased Polyhydroxyalkanoates (PHA) Production

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Conventional plastic products are made of crude oil components through polymerization. Aim of the project ANIMPOL is to convert lipids into polyhydroxyalkanoates (PHA) which constitute a group of biobased and biodegradable polyesters. Replacing fossil based plastics with biobased alternatives can help reducing dependence on crude oil and decrease greenhouse gas emissions.

As substrate material waste streams from slaughtering cattle, pig or poultry are taken into account. Lipids from rendering site are used for biodiesel production. Slaughtering waste streams may also be hydrolyzed to achieve higher lipid yield. Biodiesel can be separated into a high and low quality fraction. High quality meets requirements for market sale as fuel and low quality can be used for PHA production. This provides the carbon source for PHA production. Nitrogen source for bacteria reproduction is available from hydrolyzed waste streams or can be added separately. Selected microbial strains are used to produce PHA from this substrate.

An optimized process design will minimize waste streams and energy losses through recycling. Ecological evaluation of the process design will be done through footprint calculation according to Sustainable Process Index methodology (Sandholzer et. al, 2005; Narodoslowsky and Krotscheck, 1995).

1. Introduction

Plastics are very frequently used products which are produced from crude oil. Many products are based on plastic and therefore are also fossil based. Polyhydroxyalkanoates (PHA) or Poly- β -hydroxybutyric acid (PHB) are biologically based polymers which are now produced mostly from sugar cane or molasses (Harding et. al., 2007). Aim of the ANIMPOL project (“Biotechnological conversion of carbon containing wastes for eco-efficient production of high added value products”), funded by the European Commission within the 7th Framework program, is to produce biobased plastics (PHA) out of animal waste streams.

Especially waste from slaughtering industry can be used as source for lipids and nitrogen. Both are needed for PHA production. Starting from rendering products like tallow, biodiesel can be produced chemically via transesterification. Two different

