

Chemistry Department

Production of polyhydroxyalkanoates from oil-containing substrates

Biochemical and Process Engineering Group



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- since 2010: PhD student
- 2009 - 2010: BI, project Rethink, Delta Cafés
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- nº publications: 3

Objectives

Polyhydroxyalkanoates (PHAs) are bioplastics commonly obtained through fermentation of high cost substrates (e.g. simple sugars), which constitute an economical problem at industrial scale. Thus, waste oils and/or byproducts are proposed to be used for PHAs production. The **main objectives** for this research project are:

- ❖ Screening of **PHA-accumulating bacteria** (e.g. *Pseudomonads*) and **oil-containing wastes** (e.g. used cooking oils) in order to select the most suitable bacterial strain/substrate to produce PHAs;
- ❖ **Optimization of the process** using online monitoring techniques - near infrared spectroscopy (**NIRS**) - and polymer characterization in terms of its physical-chemical, mechanical and thermal properties.

Methodology

The criteria for bacteria strain and oil-containing substrates screening tests will be:

- ❖ selection of PHA-accumulating bacteria which **are already published and non-published** as capable to consume oily substrates;
- ❖ selection of **new PHA-accumulating bacteria** isolated from oily substrates;
- ❖ selection and characterization of oil-containing substrates, taking into account their **availability and price as a waste and/or by-product**, the **disposal issues**, and their **chemical composition**.
- ❖ selection of the best bacterial/oil-containing substrate pairs for process **optimization in larger scales** (e.g. process productivity, polymer content, etc);
- ❖ use of online monitoring techniques – NIRS – for polymer production and substrate consumption

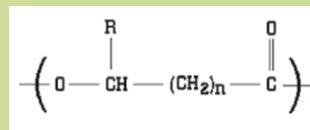
Expected Results

It is expected:

- ❖ to found new PHA-accumulating bacteria capable to use oil-containing substrates and to accumulate high polymer content.
- ❖ to produce different types of polymers, namely, in terms of their physical-chemical, mechanical, rheological and thermal properties.
- ❖ the NIRS will be an useful tool to understand the production mechanisms for PHA production, since it is possible to have an online correlation between oil-consumption and polymer production, in terms of their organic composition.



Intracellular PHAs granules



Chemical structure of PHAs monomers



Bioreactor



Used cooking oils



PHA powder

Funding

SFRH/BD/72142/2010