



## BIOTECHNOLOGY AND ENGINEERING: NEW FRONTIERS FOR MATERIALS FOR A SUSTAINABLE DEVELOPMENT

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### Background

Sustainability, environmental issues and green chemistry are becoming increasingly relevant in the development of new generation materials, products and processes. In order to reduce the environmental impact of production processes and the emissions of greenhouse gases into the atmosphere, it is necessary to limit the use of raw materials of fossil origin and to recover and recycle wastes as raw material to produce new goods, in a circular economy optics.

### Objectives

This PhD project aim to develop and assess new biotechnologies for the production of bacterial bioplastic (polyhydroxyalkanoates – PHAs) using industrial wastes.

### Methodologies

- Selection of bacterial strain: evaluation of different bacterial characteristics and cultivation of standard bacteria for preliminary tests.
- Cultivation of bacteria for the production of bioplastic.
- Cell breakage tests: assessment of the most sustainable technology for the cell rupture and the recovery of intracellular bioplastic.
- Waste recycle: preparation of new bacteria environment, based on the wastes obtained from incinerator fly ash stabilization technologies.
- Characterization of materials using biophysical and chemical techniques.

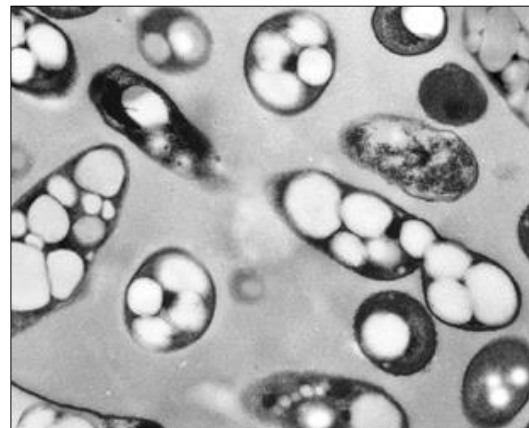


FIGURE 1. BACTERIAL CELLS WITH PHA CYTOPLASMIC INCLUSIONS  
([www.bio-on.it](http://www.bio-on.it))

### Expected Results and Impact

Plastic is one of the most used materials in today's activities, but it is posing serious threat to environment and human health. Bacterial bioplastic has garnered attention as an alternative to petroleum-derived plastic due to its biodegradability and biocompatibility. This project aim to contribute at reducing bioplastic production cost and at increasing its sustainability.