# Method for PHA recovery and purification from mixed microbial cultures

**KEYWORDS**

- ❑ BIOPLASTICS
- ❑ PURIFICATION
- ❑ SUPERCRITICAL FLUIDS
- ❑ GREEN SOLVENTS
- ❑ ENZYMES

**AREA**

- ❑ CHEMISTRY & BIOTECHNOLOGY


**CONTACTS**

➢ PHONE NUMBERS
+39.06.49910888
+39.06.49910855

➢ EMAIL
u_brevetti@uniroma1.it



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**Patent Type**
Patent for invention

**Ownership**
Sapienza University of Rome 100%

**Inventors**
Cleofe Palocci, Laura Chronopoulou, Francesco Valentino, Laura Lorini

**Industrial & Commercial Reference**
Application in the field of bioplastics for technological use.

**Time to Market**
The developed technology was validated on a laboratory scale, corresponding to the TRL4 level.

**Availability**
Cession, Licensing, Research, Development, Experimentation, Collaboration, Start-up and Spin-off.

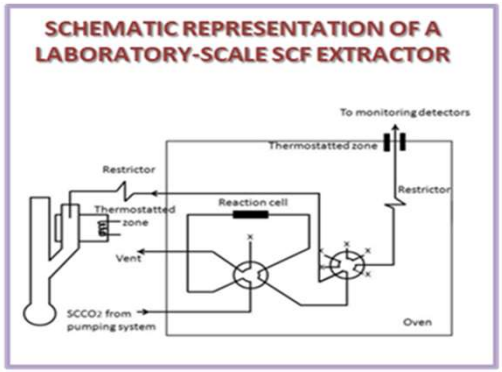


**Fig. 1** Schematic representation of an extraction system that uses supercritical fluids on a laboratory scale.


**Abstract**
The invention concerns an innovative separation and purification technique of polyhydroxyalkanoates from mixed microbial biomass. The technology used exploits, alone or in combination, some separation methods based on green chemistry approaches with low environmental impact. In this way, the use of chlorinated solvents is generally replaced by green reagents.



**Fig. 2** SEM micrograph of bacterial cells producing PHA.

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**Technical Description**

The purification techniques object of the invention can be used for the recovery of polyhydroxyalkanoates produced from mixed microbial cultures. The technique involves the use of freeze-dried and finely ground biomass, which will then be treated with aqueous solutions and / or green solvents. The patented separation and purification technique provide the use of one or more steps, depending on the degree of purity of the polymer to be obtained

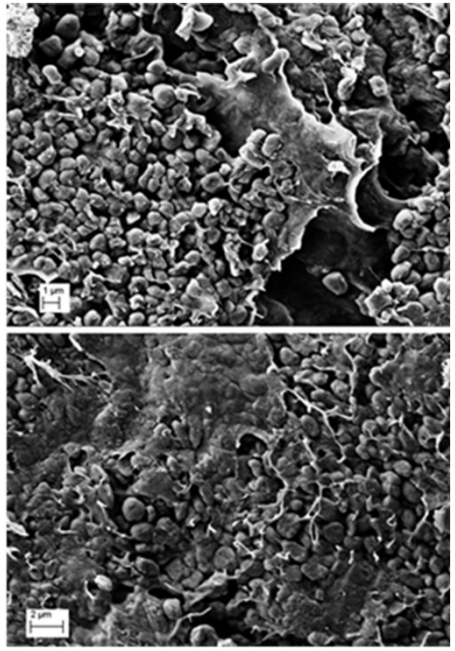

**Fig. 3** SEM micrograph of bacterial biomass containing PHA and treated with SCCO2 and green reagents.

**Technologies & Advantages**

As is known, supercritical fluids are often used to replace organic solvents, due to the interesting physical properties that characterize their solvent power. The high density of these fluids provides them with high solvent power, while the high diffusion coefficient and low viscosity values allow the application of supercritical fluids as solvents for the extraction of organic compounds from solid matrices. However, carbon dioxide is the most used supercritical solvent, mainly for its low cost, but also for the fact that this compound is easily available with very high purity. Furthermore, carbon dioxide is non-toxic, non-flammable and non-explosive, and these characteristics are important in terms of safety. Furthermore, supercritical CO2, by virtue of its critical parameters and properties, is the solvent of choice for industrial applications, allowing to operate at relatively low temperatures, avoiding thermal degradation of the compound to be treated.

**Applications**

Supercritical extraction is an important separation technique used in the following areas:

- extraction of aromas and essences from vegetable matrices;
- extraction of seed oils;
- pasteurization of food matrices;
- column splitting;
- micronization;
- rapid expansion of a supercritical solution (RESS - Rapid Expansion of Supercritical Solutions) applied to pharmaceutical powders;
- precipitation induced by supercritical anti-solvent (SAS - Supercritical Anti-Solvent) starting from a homogeneous solution of substances of pharmaceutical interest;
- precipitation from gas saturated solutions (PGSS - Particles from Gas Saturated Solutions);
- purification;
- microencapsulation and coating of drugs for controlled release systems.

Extraction with supercritical fluids is a Green Technology that guarantees environmental sustainability to the process and a high degree of quality and purity of the extracted product.


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