



Pulsed Electric Fields for Bioprocess Intensification

What if valuable intracellular products could be released without fully destroying the cells? acib offers expertise in pulsed electric field (PEF) treatment as a mild, adjustable tool to permeabilize microbial biomass and improve recovery of proteins, cell wall components and other intracellular products. The approach is especially relevant for fungal and yeast-based fermentations, where downstream processing can become a major cost driver.

BACKGROUND

Fermentation processes are gaining importance in food biotechnology, alternative proteins, enzymes, pigments, functional ingredients and recombinant production. However, many valuable compounds remain intracellular or are bound within complex microbial structures. Their recovery can require extensive downstream processing, increasing cost, process time and product loss.

Conventional cell disruption methods can be energy-intensive, difficult to control or incompatible with repeated product recovery from living biomass. This is particularly relevant for filamentous fungi, where mycelial morphology, cell wall structure and product localization can make extraction challenging.

TECHNOLOGY

Pulsed electric fields offer an interesting alternative: short electric pulses can permeabilize microbial cells in a controlled manner. In downstream processing, PEF can be used as a continuous process, for electroporation-based permeabilization of microbial biomass to facilitate recovery of intracellular components such as proteins, mannoproteins, beta-glucans, pigments or cell wall constituents. In filamentous fungi, PEF treatment of mycelia from genera including *Pleurotus*, *Laetiporus*, *Aspergillus* and *Rhizopus* enabled liberation of up to 48.5% of total intracellular proteins under tested conditions.

A particularly interesting concept is sublethal PEF treatment: fungal mycelium is treated, intracellular components are extracted under sterile conditions, and the biomass is then returned to fresh medium for further cultivation. This repeated extraction-and-regrowth approach was demonstrated over several cycles and may support semi-continuous product recovery from fungal (and other) fermentations.

OFFER

acib offers to evaluate PEF-treatment for company-specific biotechnological processes using yeasts, filamentous fungi or other microbial production systems.

IP developed in such projects can be fully transferred to the industrial partner.

EXPERTS

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DEVELOPMENT STATUS:

Technology Readiness Level 4
(Technology Validated in Lab)

KEYWORDS

- Pulsed electric fields
- PEF treatment
- Electroporation
- Fermentation intensification
- Fungal biotechnology
- Filamentous fungi
- Cell permeabilization
- Intracellular protein recovery
- Sublethal extraction
- Downstream processing
- Bioprocess intensification

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