

Production of agromaterials by bioextrusion of a solid lignocellulosic material seeded with fungal biomass

PATENT FR2102617

BIOPROCESSES - WHITE BIOTECHNOLOGIES - ENVIRONMENT



The LCA (Laboratoire de Chimie-Agro-Industrielle), BBF (Biodiversité and Biotechnologie Fongique) and CRT CATAR teams have developed, through the twin-screw extruder, a process for using **binding properties of filamentous fungi to produce agro-materials from lignocellulosic substrates.**

This process provides a **controlled destructuring** of lignocellulose by jointly promoting its inoculation with a mycelial suspension to obtain **massive and homogeneous fungal colonisation** of the lignocellulosic substrate.

Description of the invention

The choice of the screw profile and the extrusion conditions provide in a first section of the extruder for a thermal and mechanical treatment leading to **a partial destructuring of the fibers** and a **partial or total inhibition of the endogenous flora** of the studied substrate.

A second section of the extruder is configured to improve the inter-fibrous diffusion of the fungal inoculum in order to obtain a **homogeneous mixture** of the substrate with the mycelial filaments and thus a better fungal colonisation. After a solid state fermentation for a defined period of time, the colonised substrate is used to produce **biodegradable** agro-materials.

The use of filamentous fungi allows **mechanical strength and stiffness of materials** to be **at least doubled** compared to materials produced from the fungus-free extruded lignocellulosic substrate.



ADVANTAGES

This 3 in 1 process developed provides for:

- A total or partial inhibition of endogenous flora in order to control its load
- A partial destructuring of the substrate to achieve a particle size suitable for fungal growth and the texture of the final material in a short time
- An inoculation of fungal biomass and a growth of selected strains without nutrient supply

KEYWORDS: seeding, lignocellulose, fungi, twin-screw extrusion, agro-materials

APPLICATIONS

This process makes it possible to shape agro-materials with different densities:

- Low density directly in the mold (see photo on the left) with properties and applications similar to those of expanded polystyrene: packaging, thermal insulation, building materials, toys, surfboards, events, signage, etc.
- Higher density by thermo-pressing after a solid state fermentation of inoculated extrudate. The fungal development provides an improved holding of the fibers to themselves (see photo on the right).

PARTNERSHIP / LICENSING

Collaboration / License on patent or license option agreement with an R&D validation program

TRL 1 2 3 4 5 6 7 8 9

STAGE OF DEVELOPMENT: Research teams have successfully validated the proof of concept. They offer now collaboration with an industrial partner to jointly accelerate the maturation of the technology and develop the process under industrial conditions specific to a field of activity. This invention is the subject of a patent application FR2102617.

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