



ACTIVE, INTELLIGENT AND SUSTAINABLE FOOD PACKAGING
USING POLYBUTYLENESUCCINATE

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WHAT IS PBS?

Polybutylene succinate (PBS) is expected to become an important source of bio-based material for food packaging in the coming years. PBS is produced with monomers obtained by bacterial fermentation: succinic acid and 1,4-butanediol that can be synthesized from succinic acid. The annual production capacity of bio-based succinic acid is expected to reach 200.000 tons by 2015.

With a melting point at 110°C, PBS can be considered as a standard thermoplastic which can be used in a large range of applications between -20 and 100°C. The crystallinity and the semi polar structure confer a good rigidity to this soft polyester. The high crystallisation rate allows high speed industrial processes, as it is the case for polypropylene.

THERMOMECHANICAL PROPERTIES

PBS is a rubbery (soft) semi crystalline polymer with a glass transition temperature (T_g) around -30°C. These characteristics locate PBS between Polyethylene (T_g -120°C) and polypropylene (T_g -10°C). From a thermomechanical point of view PBS is close to polyolefins and very far from PLA.

GAS TRANSFER

PBS oxygen transmission rate is three times less than the one of PLA. PBS is considered as a middle oxygen barrier, and a middle/poor water barrier compared to polyolefins, which show bad oxygen barrier and good water barrier. To extend PBS uses, the goal is to find routes to improve its water barrier properties.

SENSITIVITY TO HYDROLYSIS

Degradable soft polyesters such as fossil based PBS have been primarily designed for biocompostability or natural biodegradation at end of life. In that scope, the sensitivity of polyesters to hydrolysis was not an issue. In the situation of soft polyester introduction in packaging market the case is obviously different and adapted solutions of polymer stabilization must be developed.

MAIN CONTACT ON PBS

Patrice Dole (CTCPA)

SUCCIPACK IS AN FP7 PROJECT

expected to bring a major innovation for the European food and packaging industry. Its objective is to develop new food packaging materials based on polybutylene succinate (PBS). PBS is a promising bio-based polymer obtained from succinic acid and 1,4- butanediol. The project will explore the potentiality of this new material by developing adapted PBS grades, structures, formulations, treatments and recycling routes. Its environmental impact will be evaluated through Life Cycle Analysis (LCA). It will contribute to answer the consumers demand for green and safe food packaging.

www.succipack.eu



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PACKAGING MATERIAL

The aim of SUCCIPACK is to develop sustainable, active, and intelligent food packaging materials based on green PBS that can be flexibly used by packaging and food industries. A first aspect is the optimization of the synthesis and compounding of polymer and copolymer grades for industrial plastic transformation processes to obtain films, trays and pouches. Tailored packaging functionalities will be obtained by flexible in-line surface treatments to control gas barrier properties and to introduce antimicrobial activity.

The PBS packaging material will be developed in close cooperation with industrial partners including four SMEs:

- **ARD**
- **Leygatech**
- **NaturePlast**
- **Topchim**
- **Velfor Groupe**

MAIN CONTACT ON PACKAGING MATERIALS
Patrice Dole (CTCPA)

FOOD PACKAGING

SUCCIPACK aims to facilitate the introduction of new packaging materials in existing food packaging production lines: limited investments should be needed to use the new material in existing processes. To achieve this, dedicated PBS grades and formulation for injection, moulding, extrusion film blowing and thermo-forming will be developed.

The flexibility of the technology will be assessed by the participating SMEs, which will be testing the materials in their production lines. The performances of the bio-based packaging materials will be tested on several food products such as cheeses, and ready-to-eat vegetables, fish products, organic and vegetable ready-to-eat meals, snacks, beef, chicken and turkey meat.

These tests will be realized in cooperation with four main food companies:

- **ConBio**
- **Gimar**
- **Mambelli**
- **Ortoreale**

New packaging material needs to guarantee food safety and quality: it should contribute to the microbiological quality of the food, maintain organoleptic and nutritional properties of the food and prevent migrations from the packaging materials to the food.

SUCCIPACK will address these requirements by:

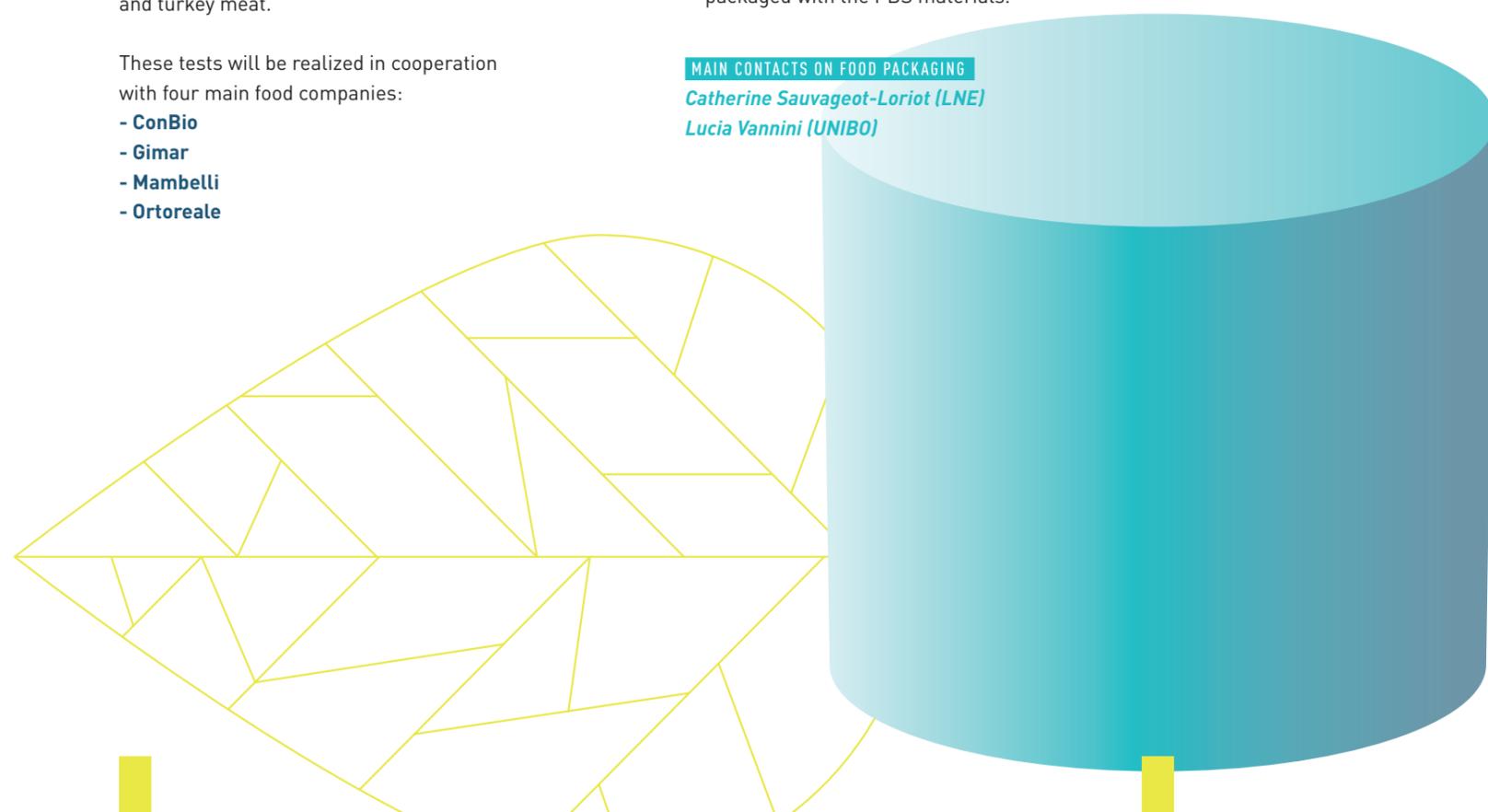
- 1 Developing materials with controlled barrier and permeation properties.
- 2 Evaluating its aroma scalping behaviour.
- 3 Investigating PBS migration behaviour with the adaption of predictive tools to PBS transfer modelling and.
- 4 Monitoring over storage the microbiological and quality indicators of different foods packaged with the PBS materials.

MAIN CONTACTS ON FOOD PACKAGING
Catherine Sauvageot-Loriot (LNE)
Lucia Vannini (UNIBO)

LCA AND LCC

The performance and safety of the novel packaging materials will be assessed for selected food products, representative of different food categories and preservation technologies. Special efforts will be put to explore PBS recycling routes, including chemical recycling by monomerization. An original intelligent labelling function will be added to monitor material degradation and recondensation, during shelf life and recycling. Life cycle assessment (LCA) and life cycle cost analysis (LCC) will be applied to guide the material development and to assess the sustainability of the whole packaging concept.

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