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Ph.D. thesis (2023-2026)  
LGP2 (J. Bras; E. Mauret)

# Development of innovative process for 3D cellulosic materials

*Développement de procédés innovants pour l'obtention de matériaux cellulosiques*

*tridimensionnels*

## Context

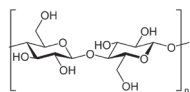
### Single use plastics: a modern issue

*New legislation pushing manufacturers to find alternatives to plastic*

- SUP (Single Use plastic) legislation: deposit in 2018.
- AGECE (Anti-Gaspillage pour une Économie Circulaire) law: deposit in 2019.
- PPWR (Packaging and Packaging Waste Regulation): deposit in 2022.

### Cellulosic Materials

- Bio-based and biodegradable.
- World's most naturally produced biobased polymer.
- Production and recycling chain well managed.



### Chaire Cellulose Valley

- An organization dedicated to finding high performance alternatives to cellulose-based single-use plastics.
- Linking research, education and industry across the cellulose packaging value chain.



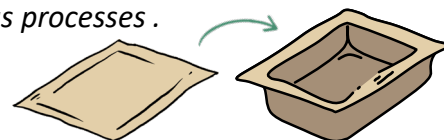
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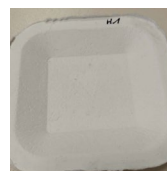
## Objectives

### 3D shaping of a cellulosic material

*Obtaining a three-dimensional fibrous material and understanding the technical challenges associated with the various processes.*



Ex: Laboratory 3D samples.



### Surface functionalization

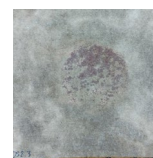
*Binging specific properties (barrier properties, recyclability, ...) to a substrate with different processes.*



Ex: Colored cobb oil of paper samples without and with coating.



Coating

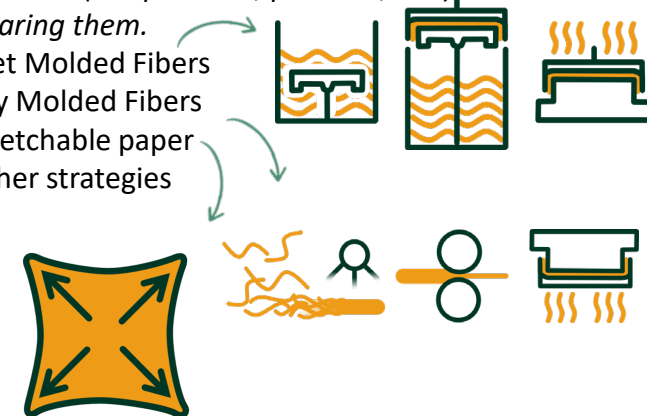


## Methods

### 3D shaping of a cellulosic material

*Understanding different processes by varying parameters (temperature, pressure, etc.) and comparing them.*

- Wet Molded Fibers
- Dry Molded Fibers
- Stretchable paper
- Other strategies



### Surface functionalization

*Comparing surface functionalization methods adapted to substrates (2D then 3D) and developing new ones.*

- Spray coating
- Screen printing

