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Ph.D. thesis (2023-2024)
LGP2 (A. Blayo; E. Mauret; J. Bras) — Cellulose Valley

Development of innovative process for 3D cellulosic packaging.

Développement de procédés innovants pour l'obtention de matériaux cellulosiques tridimensionnels.

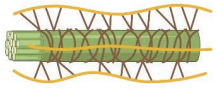
MatBio

Context / Objectives

Climate change and single use plastics: modern issues leading to various legislations push towards bio-based materials.

→ Cellulose

- Bio-based and biodegradable.
- Easily available.
- Recyclable.



→ Rigid 3D Cellulose-base packaging challenges:

- Innovative 3D Shaping processes
- Waterless surface functionalization
- Combination of both steps

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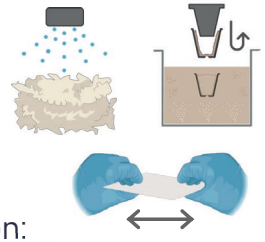
Methods

3D shaping processes:

- Wet molded fiber.
- Dry molded fiber.
- Stretchable paper.

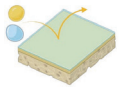


Surface functionalization:

- Spray coating.
- Pad-printing.
- Waterless coating techniques.

Combination:

- Application of barrier materials onto molded fibers.

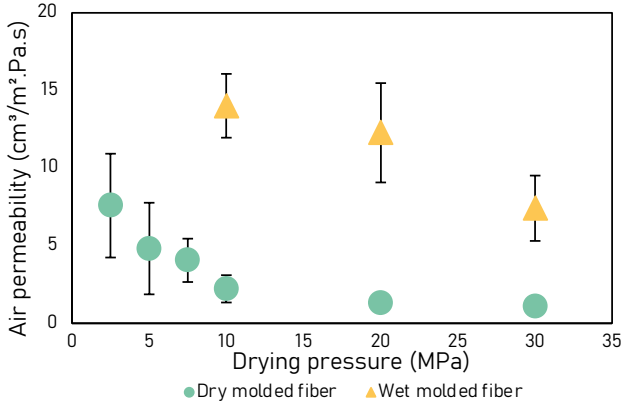


Characterization:

- Mechanical characterization (Traction, Bending).
- Surface characterization (Roughness, Epair).
- Barrier properties (Cobb, WVTR, Air permeability, Contamination monitoring after filling).

Results

High moisture material → High air permeability



Barrier solution protecting tray during oil filling

Raw molded tray

Molded tray + Barrier solution