



Sarp KÖLGESİZ

Ph.D. thesis (2025-2028)
LGP2 (N.Belgacem;D.Beneventi)
PoliTO (R.Bongiovanni)

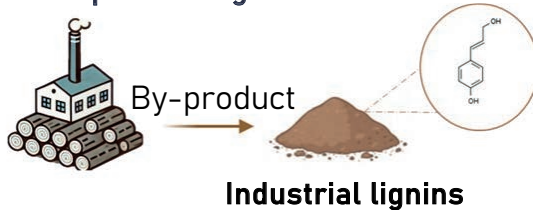
Design of an innovative wood-based biocomposite and development of its processing by 3D LDM printing and thermopressing

Elaboration d'un biocomposite innovant à base de bois et développement de sa mise en forme par procédés d'impression 3D et thermopressage

MatBio
FunPrint

Context

Biomass processing industries



The global lignin market~over €3 billion

90% of extracted lignin use as a **biofuel**



So what might be other **alternative application areas** for industrial lignin?

1) Developing fully bio-based resins as a competitive and sustainable alternative to conventional petroleum-based adhesives.

Funded by: MSCA Unite!Energy



Objectives

There are different approaches alternative to current petroleum-based materials, creating different application areas for utilization of industrial lignins.

→ To create **fully bio-based resins** which will be **formulated with phenolic groups** obtained from **depolymerized lignin** and **a bio-based alternative to formaldehyde**

↓
Thermoplastic copolymers

↓
Thermoset liquid resins

Applications:



Methods

Materials: PFA, lignin, cellulose nanoparticle → Preparing composite materials

Processing

3D printing (Liquid deposition modelling)

Spray Coating or Casting



Analysis & Characterization

Chemical properties:

FT-IR, NMR, DSC

Physical properties

Viscometer (viscoelastic property), UTM and 3-point bending test machine (mechanical properties)

Morphological property

SEM, VLM, X-ray tomography