



## LIMINA

### Lignin from MAcrosized to NANosized

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#### Summary –

Lignocellulosic biomass is a complex and resistant plant material, mainly made up of the three polymeric fractions that are cellulose, hemicellulose and lignin, which are highly entangled. Within the framework of this project, we are particularly interested in the under-valued lignin polymer which is mainly used by thermal valorization while it contains monomers with high added value. Lignin is in fact a generic term which groups together a wide family of biopolymers with aromatic skeleton. It is renewable, biodegradable, very abundant (it is the second most abundant biopolymer on earth after cellulose), and it constitutes 30% of the nonfossil organic carbon in nature. Thanks to their aromatic structure, these lignins have many properties (biocide, antioxidant, UV- light blocker...) which could be useful in wide range of technical applications.

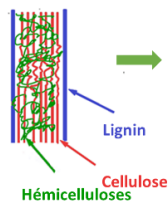
LIMINA project will first focus on the extraction of macrolignin from forestry waste (hardwood : beech ; softwood : spruce) by the mean of eco-friendly processes (organosolv and steam explosion). The second step will be the optimization of the macrolignin size reduction by using high-shear and ultrasonic homogenization processes. The last step of the project will finally be the lignin valorization through two applications : a new material reinforcement to improve the durability of biobased plastic materials and the substitution of non-biosourced and poorly biodegradable polymeric nanoparticles in pharmaceutical, cosmetic or food products.



### Lignocellulosic biomass

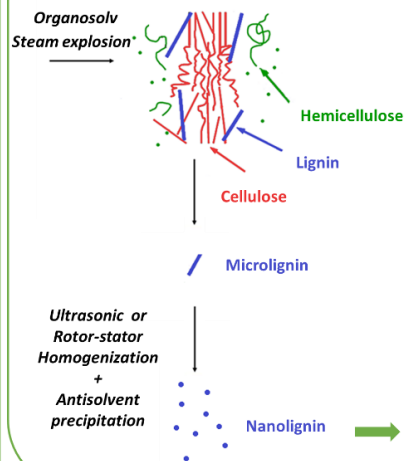


Macro scale



Micro scale  
Resource:  
Abundant  
Renewable  
Biodegradable  
Cheap

### Production of nanolignins : Green pretreatment processes



### Examples of nanolignin valorization: Properties and high value-added applications

UV light blocker  
properties :  
Biobased composites,  
Cosmetic (sunscreen)  
Bio-food film; Packaging;



Emulsion stabilization and  
Surfactant :  
Cosmetics, medicines, food



Flame retardant properties:  
Textile and wood  
applications



Reinforcement properties :  
Green adhesives for the panel  
industry ; coating epoxy or  
polyurethane resins...

