LIGNIN DEPOLYMERIZATION-UPGRADING TO BIOMATERIALS

Lignin is the main renewable resource of aromatic compounds. The native lignin present in biomass is a 3D amorphous macromolecule made up principally by the combination of three different phenylpropane monomer units: p-coumaryl alcohol, guaiacyl alcohol and syringyl alcohol, linked mainly by aryl ether bonds in a randomized way. Lignin is an abundant aromatic feedstock, but it is still largely considered as a source for heat and power from bio-refinery.

The lack of well-established processes that add value to lignin can be largely attributed to its structural complexity and associated chemical inactivity. The use of lignin as a feedstock for the production of bio-based chemicals has received increasing interest. Lignin conversion to value-added products is governed by an interplay of three technological biorefinery aspects: (i) lignocellulosic biomass fractionation, (ii) lignin depolymerization, and (iii) upgrading towards targeted (intermediate or final) chemicals. Efficient lignin depolymerization could produce a wide range of fuels and chemicals (and/or their precursors). These molecules (especially alkylated phenols) could be used to produce chemicals and materials (polymers, antioxidants, resins, medicines, or pesticides) in substitution to fossil fuel resources.

The project LIGNIN DEPOLYMERIZATION-UPGRADING TO BIOMATERIALS aims to find viable depolymerizing processes for lignocellulosic materials to obtain oligomers which can be transformed into useful reactants. In other words, obtained lignin fraction will be chemically modified in order to convert them in monomers with reactive functional groups able to be combined into resins, polymers and biobased materials. So, during the project we will try to obtain biomaterials with good mechanical performances, completely made of renewable carbon, able to fully replace significative amount of oil-based polymers.