New technologies for wood pretreatment within the concept of the biorefinery and novel uses of cell wall components

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This work addresses a novel technology for biomass pre-treatment by using aqueous-based microemulsions that are able to effectively penetrate the complex capillary structure of wood. Such concept has been recently discussed as far as the enhancement of flooding or fluid penetration as well as the dissolution of some of the components of the fiber cell wall (JCIS 381, 171–179, 2012). In this talk we will unveil the role of emulsion formulation and composition in the extent of impregnation of different wood species. We will show that salinity and the concentration of the minor, oil phase critically affects the process. In addition, surfactant choice and the synergies of surfactants mixtures play an important role as far as the extent and dynamics of fluid penetration. This is explained by the affinity between the surfactant(s) and the solid which contains conductive elements with different biomolecular constituents. With the appropriate surfactant mixture it was possible to enhance the penetration of the microemulsions (atmospheric pressure and temperature) in white pine by 83%, compared to water. We fill end the discussion by introducing some possibilities we have explored in our group as far as the industrial utilization of lignin, for example in fibers and as stabilizer of crude oils for fuel emulsions and cellulose for the production of nanopaper from waste streams.