Development of a lignin recovery process targeting its formulation and application into consumer goods

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Lignin is the main renewable source of aromatic compounds existing on Earth. It has been recognized for its potential in polymer science and production of chemicals, and more recently for its prospective use in pharmaceutical and food applications (for texture improvement). Currently, processes using aggressive conditions and chemicals produce lignin with homogeneous and controllable properties, however; its applicability is limited due to toxicity and safety issues. Emerging biorefining technologies such as Liquid Hot Water Pretreatment (LHW) followed by enzymatic hydrolysis offers the advantage of being a green process and a final product without solvent residues, nevertheless; lignin produced by LHW is a heterogeneous material by means of both molecular weight and particle size distribution (PSD), these being desired properties for industrial applications. For instance, PSD has direct impact on bioavailability, solubility in pharmaceutical excipients, and on the adhesive strength in adhesive masses.

This work focuses on developing a process for the production of Lignin obtained by LHW pretreatment with desired and tunable properties, such as particle size, surface area, pore volume as well as bioactive properties as the case of antioxidant capacity. In order to achieve this, two technologies are being evaluated for the particle formation and drying (simultaneously): Spray Drying and the Gas Antisolvent process using supercritical CO$_2$

Lignin particles obtained by the two processes have unique and different properties. The effect of processing parameters on the final product (particle size distribution, surface area, antioxidant capacity) are studied and optimized for both developments. As a final point, the products will be evaluated for their applicability as Active Pharmaceutical Ingredient (API) and adhesive masses.

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