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SIMPOSIO INTERNACIONAL SOBRE MATERIALES LIGNOCELULOSICOS

Integration of Lignocellulose and Soy Proteins: Adhesion Modification, Papermaking and Fibers

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Industrial interest in environmentally friendly materials has driven the development of a variety of products from natural resources. Individually, lignocellulose (LS) and soybean proteins (SP) are among the most investigated natural resources for nonfood applications including pulp and paper, wood adhesives, films for food packaging, composites, biobased plastics, and coatings. In fact, these resources and respective materials are highly relevant to the future of the bioeconomy in South America. However, the combined utilization of LS and SP has been reported to a very limited extent. This contribution attempts to summarize our work with soy globulins, which were successfully fractionated, characterized, and studied as far as their interactions with cellulose and lignin. The results indicate different features in their molecular affinities, which are exploited in a new application that uses SP as dry-strength agent in papermaking as well as in wood adhesives, where a higher spreading of the molecules on the surface is key to produce a better interfacial bonding. The favorable interactions between soy proteins and lignin were further evidenced in the production of micro- and nano- fibers. Defect-free fibers with increased diameter as the lignin content in the mixture was increased. The results showed good compatibility of LS and SP, enhanced by hydrogen bonding and hydrophobic effects. The compatibility between lignin and soy proteins is further highlighted when using lignocellulose substrates for bioconversion under the concept of integrated biorefineries. Overall, there is indication that commodity and added-value materials can be produced from integrating residual and abundant lignocellulose and soybean proteins.