

Discipline proposal to the PhD Program in Bioenergy (Unesp, Usp and Unicamp)

Discipline name: Advanced Topics in Biorefineries

Lignin: Chemistry, Modifications, and Utilization in a Biorefinery Concept

Period: 15 weeks (60h)

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Program

Objective

Lignins are the main byproduct in a biorefinery and evaluated as fuel in the energy balance. The proposal of the discipline is to discuss recent advanced in lignin chemistry and characterization, together with its modification in macromolecular form aiming the commercialization of these products.

Motivation

In the pre-treatment steps of biomass, knowledge in lignin structure is necessary to evaluate recalcitrance and best methods for the complete separation of the components. Lignin must be evaluated not only in respect to its energy content, but also as valuable products. For this, chemical and enzymatic modifications maintaining the macromolecular structure seems to be the best strategy for commercial products. Biorefineries already working, as the pulp and paper industry and the sugar and ethanol mills, are looking for phenolic derivatives, with more value, to support commodities production.

Content

- 1) Lignin structure and biosynthesis;
- 2) Macromolecular properties of industrial lignins;
- 3) Advances methods for lignin characterization;
- 4) Chemical and enzymatic modifications of lignins;
- 5) Modern lignin products and preliminary economical evaluation;

Bibliography

Fengel D, Wegener G. 1984. Wood: chemistry, ultrastructure, reactions, Berlin, New York.

Hyoe Hatakeyama, Tatsuko Hatakeyama, Lignin Structure, Properties, and Applications, Advances in Polymer Science, V. 232, 2009, pp 1-63.

C. Heitner, D.R., Dimmel, J.A., Schmidt, Lignins and lignans, Advance in Chemistry, CRC Press, 2010.

papers – recent reviews of the literature

written test – questions I will propose (6.7 points)

monograph concerning lignin you are using in (or related to) your thesis (3.3 points)