DEVELOPMENT OF ANALYTICAL METHODOLOGIES AND ORGANOSOLV DELIGNIFICATION PROCESSES APPLIED TO BAGASSE AND STRAW FROM SUGARCANE

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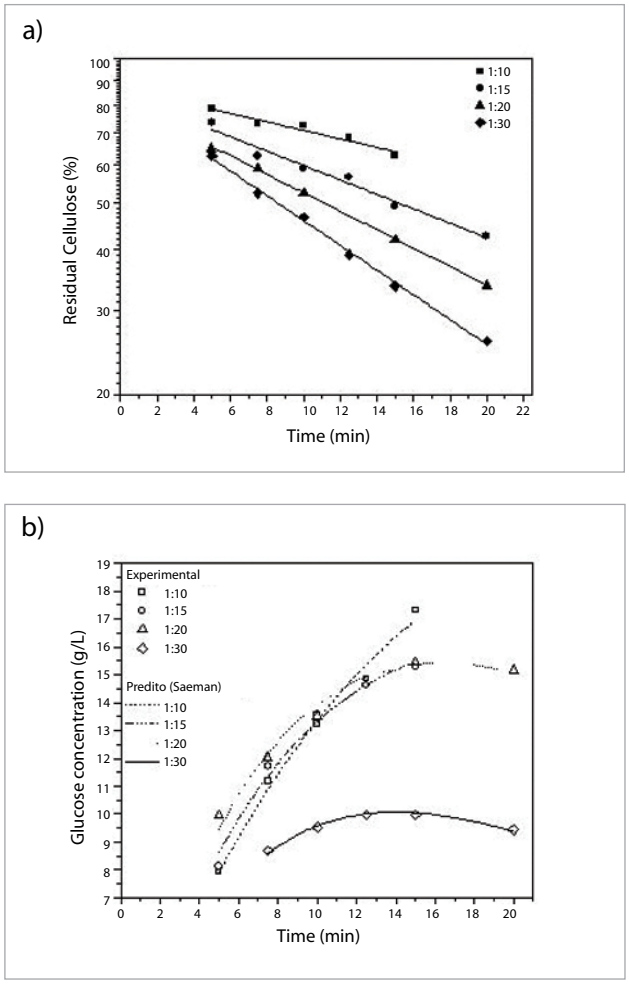

Figure 1. Hydrolysis of sugarcane bagasse pulp (fiber fraction) at 215ºC with H_2SO_4 0.07% and different solid to liquid ratios. (a) Semi logarithm plot of weight loss versus *reaction time and (b) Glucose concentration at the same reaction times*

The proposals in this project were formulated based on scientific output and experience accumulated over 20 years dedicated to the study of characterization and production of cellulose and lignin derivatives from lignocellulosic materials, with special attention to the bagasse obtained from sugarcane processing. The proposed project is focused on two main aspects: the study of lignin's solvency through delignification reactions and the development of analytical methodology for the characterization of the main components of lignocellulosic materials, particularly applied to bagasse and straw from cane sugar. The delignification processes will be investigated as pre-treatment step for polysaccharide's hydrolysis with special attention to the production of sugars from cellulose and also to recovery of lignin present in sugarcane bagasse for further industrial/commercial utilization.

Lignin's solvency will be studied using three basic processes: conventional (aqueous solutions), organosolv and organosolv assisted by supercritical fluids. As a result of these procedures, the cellulosic pulps will be employed for the production of glucose by means of acid hydrolysis of cellulose. The technique that uses fluids in the supercritical state may allow the hydrolysis of sugar without the prior separation of the lignin present in the raw materials (straw and bagasse from sugarcane).

The traditional methods for the characterization of lignocellulosic materials were developed and optimized for wood and wood derivatives (pulp and paper). Due to the different characteristics of grasses and agricultural wastes (especially from crushed cane sugar industry) the modifications of existing methods and/or development of new analytical methodologies for the chemical characterization of sugarcane bagasse is of fundamental importance for both academic studies and industrial applications.

SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

The lack of specific methodology for the characterization of sugarcane bagasse and straw leads to inadequate results and hamper both the planning of industrial applications and the interpretation of analytical data. Thus, the main aim of this study was to develop specific analytical methodologies to the chemical characterization of sugarcane bagasse. The determination of lignin was studied by the hydrolysis and dissolution of the polysaccharide fraction in sulfuric acid solutions. The sugars and derivatives of these hydrolysates were analyzed by high performance liquid chromatography (HPLC). Preliminary results showed different behavior between the sugarcane bagasse and its different fractions (fiber and pith cells) when submitted to acid treatments. The results showed the dependence of sulfuric acid concentration on lignin content determinations and the role of condensation reactions in the lignin characteristics. The gravimetric determination of lignin by Klason methodology (sulfuric acid solutions) showed that the optimum concentration of acid for determination of total insoluble lignin is in the range of 65 - 72% for all samples. Despite the similarities in chemical composition, klason lignins obtained from straw exhibited very low molar masses. Preliminary results obtained from holocellulose determinations showed also the need for optimized oxidation procedures in order to be successful applied to sugarcane bagasse analysis.

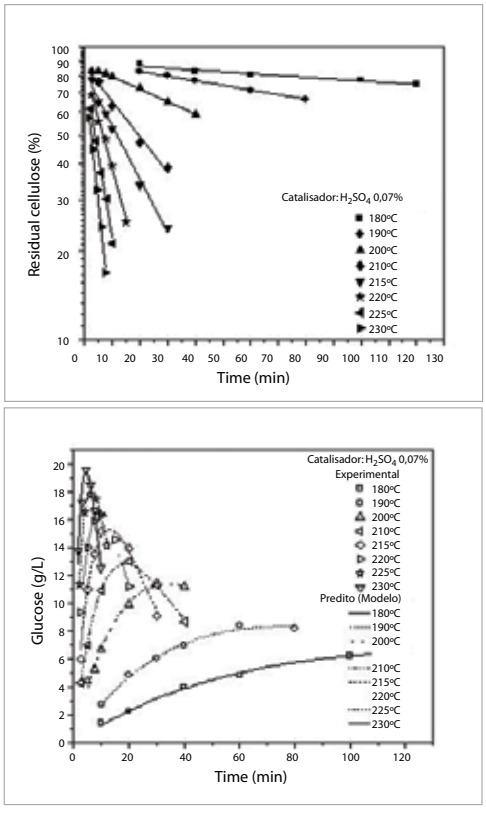

Figure 2. Hydrolysis of sugarcane bagasse pulp (fiber fraction) with H_2SO_4 0.07% at different temperatures (solid/liquid ratio = 1/10). (a) Semi logarithm plot of weight loss versus reaction time and (b) Glucose concentration at the same reaction times

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