Selectivity Study of Bagasse Hemicelluloses Removal Using Hydrothermal Pretreatment

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The production of biofuels from vegetal raw materials can be performed by different technological routes. Currently, cellulosic ethanol appears out among the alternatives for the production of liquid biofuels and requires the use of agricultural residues that contain significant amounts of polysaccharides (e.g., sugarcane bagasse). The utilization of sugarcane bagasse as feedstock for cellulosic ethanol production needs previous pretreatment steps to separate the major components (cellulose, hemicelluloses and lignin), which can be performed by means of physical, chemical and/or biological means. Within this context, this paper proposes the study of the effect of reaction times and temperature in the hydrothermal pretreatment of sugarcane bagasse in order to compare the efficiency of hemicelluloses removal and the formation of degradation products. This pretreatment is considered promising since water shows unique physical and chemical properties and can be used as solvent and reactant simultaneously. The assays were performed in tubular stainless steel reactors using preheated oil bath at working temperature from 160^{o}C to 190^{o}C, two different solid/liquid ratios (5 and 10) and reaction times from 0 to 100 minutes. After each of the treatments, the cellulignin and the liquor were recovered and characterized in terms of yield, residual lignin content, polysaccharide composition and degradation products. The results obtained showed the expected behavior of increase of the dissolution with the increase of both temperature and reaction times. Reactions conducted at 190°C showed the highest removal of cellulose, reaching 60% of yield in just 7 minutes. For the same reaction times the hydrothermal treatment performed at lower temperatures showed higher selectivity (160°C, 80 minutes, and 80% of yield). The best experimental conditions for the hydrothermal treatment should be determined considering the highest amount of hemicelluloses removal while minimizing loss of cellulose.

Supported by FAPESP

Keywords: Hydrothermal Pretreatment, Selectivity, Hemicelluloses, Sugarcane Bagasse