

Studies of Enzymatic Hydrolysis of Sugarcane Bagasse Pre-Treated by Steam Explosion

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Cellulosic ethanol (or G2) has been highlighted by its high renewable energy potential, and sugarcane bagasse is example of abundant raw material which may be used as agroindustrial byproduct for its production [1]. Bagasse is composed by lignocellulosic compounds, whose components are cellulose and recalcitrant biomass (hemicellulose and lignin), which surround the cellulose and render the enzymatic hydrolysis unfavorable [1]. Different pretreatments are studied to open the structure of recalcitrant biomass before processes for enzymatic hydrolysis, to allow the cellulose sugars monomers to be accessed [2,3]. Time Domain Nuclear Magnetic Resonance (TD-NMR) techniques were used in our research group to investigate the vapor blast pretreatment and showed the great efficiency in breaking the crystallinity of the cellulose in sugarcane bagasse [5]. The objective of this research was to analyze the enzymatic hydrolysis of previously treated bagasse by the steam explosion technique, from commercial enzyme Cellic ctec 2. Different enzyme loads 5, 10, 15 and 20 FPU / g were used, paired with enzymatic kinetics. The hydrolysis was terminated at the times of 24, 48, 72 and 96h. The methodologies used in the quantification of glucose and TRS samples after the hydrolysis period were performed with the enzymatic kit (glucose liquiform) and with the DNS reagent, for glucose and TRS, respectively. All readings were performed on the UV-VIS Spectrometer (Thermo Scientific). The best result of enzymatic load was 15 FPU / g at 48 h, glucose 13.9 g / L (table 1) and TRS was 20.3 g / L (table 2). These results were interesting, since are below the typical enzymatic load reported (20 FPU / g) and are in periods (48h) considered as viable for bioprocesses. The next stage of this study will be done in the fermentation processes of the sugars formed.

Tabela 2: Production of glucose (g/L) by the time (h), varying the enzymatic charge added in the hydrolysis.

time (h)	5 FPU/g	10 FPU/g	15 FPU/g	20 FPU/g
24	5,66 +/- 0,1	9,8 +/- 1,39	11,96 +/- 0,65	12,96 +/- 0,68
48	6,26 +/- 0,56	9,28 +/- 0,96	13,92 +/- 0,34	16,72 +/- 1,81
72	8,44 +/- 0,78	11,56 +/- 0,18	14,38 +/- 0,19	16,34 +/- 0,08
96	7,59 +/- 0,52	12,77 +/- 1,51	16,1 +/- 1,26	17,6 +/- 0,65

Tabela 1: Production of TRS (g/L) by the time (h), varying the enzymatic loading added in the hydrolysis.

time (h)	5 FPU/g	10 FPU/g	15 FPU/g	20 FPU/g
24	12,35 +/- 0,67	17,81 +/- 0,42	20,21 +/- 0,13	22,86 +/- 3,08
48	12,63 +/- 0,21	16,73 +/- 0,46	20,32 +/- 0,54	26,06 +/- 2,27
72	14,69 +/- 4,64	21,97 +/- 2,02	27,63 +/- 1,92	29,55 +/- 1,49
96	14,28 +/- 2,31	20,75 +/- 1,82	29,90 +/- 4,37	28,88 +/- 2,24

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