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Alkaline pretreatment scale up study aiming second-generation ethanol production.

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Two pretreatment conditions were performed in pilot scale (350 L) in order to provide information about the influence of different heating and stirring system between bench and pilote scale, namely (A5 - 30 min, 130°C, 1.5% w/v NaOH, 0.15% w/w AQ and A7 - 30 min, 170°C and 1.5% w/v NaOH, 0,15% w/w AQ). The influence of this scale up on mass yield, solubilization rates and enzymatic conversion was analyzed in order to choose the pretreatment condition that provide the high glucose yield liquor for second-generation ethanol production. These conditions were elected from a 23 experimental design. Experiments without anthraquinone (WAQ) were also performed. The anthraquinone addition did not leads to substantial cellulose preservation in the laboratory scale. However in pilot-scale the AQ addition resulted in 67.4% and 28.5% of cellulose preservation for reactions at 130°C and 170°C respectively in relation to those studies without it addition. Since diffusion operates a huge influence on anthraquinone action, the most efficient heating system and agitation of pilot scale in relation to laboratory scale were probably the determining factors for the more effective performance. Temperature also seems to have maximal effect on AQ pretreatments performed in pilot scale, where at lower temperature ranges (130°C) the preservation of cellulose was favored in relation to experiments at 170°C. The scale-up was considered successfully made and considering the pretreatment mass yield and enzymatic conversion the condition named A5 (130°C, 30 min, 1.5% (w/v), 0.15% (w/w) AQ) was chosen as the best one resulting in 293 kg of glucose from 1 ton of raw sugarcane bagasse (extrapolating pilote results).

Biography

Simone Nakanishi is a Biochemical Engineer, Master in Biotechnology at University of São Paulo in collaboration with the Universidad Autónoma de Chihuahua - México (Biomass Conversion for Membrane production, 2010) and a PhD student at University of São Paulo working with lignocellulosic biomass conversion (pretreatment, enzymatic hydrolysis, fermentation and lignin characterization) as raw materials for second-generation ethanol and high value-added products.

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