

Topic: Development of alkaline/organosolv pretreatment of rice straw

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ABSTRACT

Lignocellulose represents a promising starting material for conversion into fuels and chemicals in biorefineries; however, its efficient conversion to sugar requires a pretreatment step. In the present research, the pretreatment of rice straw by alkaline/organosolv process was studied aiming to separate high quality lignin and enhance enzymatic digestibility of the cellulose-enriched solid. Effects of alkaline (NaOH, NH₃ solution, and tri-ethyl amine) on organosolv pretreatment using acetone, ethyl acetate, and ethanol at varying temperature, reaction time, acetone content, alkaline concentration, percent solid loading including solvent regeneration after pretreatment were studied. The NaOH in an acetone system was shown to be the best condition in terms of cellulose selectivity and enzymatic digestibility. The optimal alkaline-catalyzed pretreatment reaction contained 4 % (w/w) of rice straw with 20 ml of 50% (w/v) NaOH solution in 180 ml of acetone and treated at 80°C for 30 min with the initial pressure at 20 bars and mixing at 250 rpm. This led to the highest glucose yield of 869 mg/g pretreated biomass which was equivalent to the maximal glucose recovery of 78.97% based on available glucan in the native biomass. The work shows potential of alkaline pretreatment in organic solvent system for increasing digestibility of lignocelluloses. The high efficiency and selectivity of the developed pretreatment process could provide a high glucose yield with purity from lignocellulosic biomass for further conversion to value-added biorefinery products.

Keywords: Biorefinery, Lignocellulose, Alkaline/Organosolv, Pretreatment