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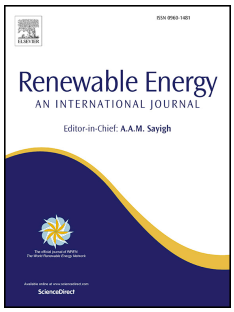

Evaluation, applicability and optimization of advanced oxidation process for pretreatment of rice straw and its effect on cellulose digestibility

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Evaluation, applicability and optimization of advanced oxidation process for pretreatment of rice straw and its effect on cellulose digestibility

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Abstract: Rice straw, a renewable feedstock, is recalcitrant and its degree of polymerization makes pretreatment obligatory for subsequent bioconversion. The present study explores an advanced oxidation process i.e. Alkaline Wet Air Oxidation (AWAO)[1] as a pretreatment for rice straw and scrutinizes the effect of operation parameters on cellulose recovery, hemicellulose solubilization and lignin removal through Response Surface Methodology (RSM)[2]. AWAO resulted in 68-90% cellulose recovery, 67-87% hemicellulose solubilization and 32-66% lignin removal while generating limited inhibitors. AWAO caused oxidative delignification, hemicellulose deacetylation and cleavage of carbohydrate-lignin linkages as revealed by FT-IR[3], thereby improving cellulose accessibility indicated by 42-89% enzymatic cellulose convertibility (%ECC) or % cellulose conversion[4]. The findings of the present study indicate minimization of chemical input and absence of potent inhibitors in the liquor which collectively implies reduction in freshwater requirements, minimization of waste generation and its treatment cost.

Keywords: *Rice straw; alkaline wet air oxidation; response surface methodology; FT-IR; SEM; saccharification*

[1] AWAO: Alkaline Wet Air Oxidation; [2] RSM: Response Surface Methodology; [3] FT-IR: Fourier Transform Infrared Spectroscopy; [4] %ECC: % enzymatic cellulose convertibility; [5] LCB: Lignocellulosic biomass; [6] FPU: Filter Paper Units; [7] CBU: Cellobiase Units; [8] DM: dry matter