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KINETICS OF BIOETHANOL YIELD IN DIFFERENT CELLULOSIC MATER IN SEPARATED HYDROLYSIS AND SIMULTANEOUS SACCHARIFICATION FERMENTATION

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ABSTRACT

Unbleached pulp and primary sludge, from pulp and paper industry, rich in cellulosic fibres, were tested in separated hydrolysis and fermentation (SHF) and simultaneous saccharification and fermentation (SSF) to produce bioethanol. An initial carbohydrate (CH) content of 25 g L^{-1} was used in SHF and SSF, in batch or fed-batch operation conditions (three more additions of the same value). Novozymes Cellic® CTec2 cellulase (35 FPU g_{CH}^{-1}) and Saccharomyces cerevisiae were tested. In SHF of unbleached pulp, fed-batch enzymatic hydrolysis increased the reducing sugars with the improvement of the hydrolysis efficiency (73% to 82%). In SSF, fed-batch operation mode improved ethanol concentration from 13.9 to 26.8 g L^{-1} for unbleached pulp, despite of lowering ethanol yield and productivity. As ethanol concentration in SSF batch operation for sludge reached 9.1 g L^{-1}, the corresponding fed-batch operation is promising and is currently under study. Moreover, bioconversion of primary sludge by SSF is viable without a pre-treatment.