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ECO-FRIENDLY PROCESS COMBINING ACID-CATALYST AND THERMOMECHANICAL PRETREATMENT FOR IMPROVING ENZYMATIC HYDROLYSIS OF HEMP HURDS.

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Abstract:

The aim of this study was to investigate a pretreatment by combined H₂SO₄ acid-catalyst and thermomechanical process to improve hemicelluloses solubilization of hemp hurds and subsequently enzymatic hydrolysis extent of potentially fermentable sugars. It was found that the sugars released were gradually increased with treatment severity. Soluble sugars generated before enzymatic hydrolysis (R₁) increased up to 2.23 g/L indicating that autohydrolysis reaction occurred during pretreatment. Consequently, the solubilization of hemicelluloses was correlated with combined severity factor (CS). As a result, increase of overall reducing sugars (ORS) from 23.4% (untreated) to 81.4% was observed at optimized conditions of steaming temperature of 165 °C for 30 min and acid loading of 62.9 g/kg DM (dry material) corresponding to CS=1.2, with limited production of identified by-products: 0.035 g/L and 0.46 g/L (per 100 g DM) for furfural and HMF, respectively. Structural and physicochemical modifications of biomass were observed by FTIR, A_{BET} and SEM.

Keywords:

Industrial hemp, pretreatment, H₂SO₄ spraying, combined severity factor, enzymatic hydrolysis.

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