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Comparative evaluation of OrganoCat and selected advanced oxidation processes as pretreatment to enhance cellulose accessibility of rice straw

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Abstract- The rising demand of liquid transportation fuels and increased global energy consumption has compelled a switch from petroleum- to lignocellulosic biomass-based (LCB) biofuels. However, the foremost hindrance in bioconversion of LCB to fuels is the biomass recalcitrance, coercing pretreatment for enhancing the LCB hydrolysis efficiency via increased cellulose accessibility. In the present study, rice straw was used as feedstock owing to its renewability & abundance and was pretreated with wet air oxidation (WAO), alkaline wet air oxidation (AWAO), alkaline peroxide-assisted wet air oxidation (APWAO) and Organocat pretreatment to enhance the cellulose accessibility. The efficiency was examined in terms of enhancement in cellulose recovery, hemicellulose solubilisation, lignin removal and limited generation of sugar and lignin degradation products. The structural and surface changes occurring post- pretreatment and enzymatic hydrolysis were scrutinized through FT-IR and SEM which corroborated the removal of lignin and hemicellulose, thereby, increasing the cellulose accessibility. The comparative evaluation demonstrated that AWAO was advantageous owing to the increased cellulose accessibility, energy-efficiency, generation of limited carbohydrate & lignin degradation products and minimum waste generation.

Keywords: *Rice straw; Advanced oxidation processes; Alkaline wet air oxidation; OrganoCat; Alkaline peroxide-assisted wet air oxidation; Delignification; FT-IR; SEM*