

Optimized Microwave Pretreatment of Rice Straw for Conversion into Lignin Free and High Crystalline Cellulose

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Abstract : The present study aimed to evaluate the effect of microwave application in synergy with the conventional sodium chlorite delignification of rice straw biomass. For the study, Box-Behnken experimental design involving four independent parameters, each with three levels viz. microwave power (480-800 W), irradiation time (4-12 min), bleaching solution concentration (0.4-3.0%), and bleaching time (1-5h) was used. The response was taken in the form of delignification percentage. The optimization of process parameters was done through response surface methodology. The respective optimum parameters of microwave power, irradiation time, bleaching solution concentration, and bleaching time were obtained as 671 W, 8.66 min, 2.67%, and 1h. The delignification percentage achieved at optimum conditions was 93.51%. The spectral, morphological, and x-ray diffraction characteristics of the rice straw powder after delignification showed a complete absence of lignin peaks, deconstruction of lignocellulose complex, and an increase of crystallinity (from 39.8 to 61.6 %).

Keywords : lignocellulosic biomass, delignification, microwaves, rice straw, characterization

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