

Surface characterization of chemically modified biochar derived from rice straw

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Biochar produced by decomposing variety of biomass feedstock is a carbon rich product that act as an efficient material for various applications such as contaminant management in soil and water, soil amendment in agriculture *etc.* Biochar obtained from biomass such as wood, manure and leaves have been studied worldwide for their adsorptive capacity, but reports on use of rice straw for such applications are limited. Hence the objective of the present study is to produce biochar using locally available rice straw.

Samples of rice straw were chemically decomposed at 400 °C with H₃PO₄. In order to find a suitable surface modifier to increase the surface porosity and acidity, the resulted biochar materials were treated separately with oxidizing agents such as HNO₃, KOH and H₂O₂. The pore size distribution of modified and the control samples were studied using scanning electron microscopy (SEM) technique. The functional groups available on biochar prior to and after chemical modifications were analyzed using the Fourier transform infrared spectroscopic (FTIR) technique.

The FTIR spectral analyses disclosed significant increase in concentrations of the functional groups (carboxylic, alcoholic hydroxyl, phenolic hydroxyl and carbonyl) available on the surface of the KOH treated sample. The SEM analysis revealed about 40% increment in pore diameter of the rice straw biochar that was modified with KOH and H₂O₂ in contrast to non-modified biochar. Hence, according to the present study, the surface of the decomposed rice straw can be effectively modified with KOH to increase its surface porosity and functionality.

Keywords: Biochar, Rice straw, Surface modifier