

Depolymerization of Lignin in Sugarcane Bagasse by Hydrothermal Liquefaction to Optimize Catechol Formation

Authors : Nirmala Deenadayalu, Kwanele B. Mazibuko, Lethiwe D. Mthembu

Abstract : Sugarcane bagasse is the residue obtained after the extraction of sugar from the sugarcane. The main aim of this work was to produce catechol from sugarcane bagasse. The optimization of catechol production was investigated using a Box-Behnken design of experiments. The sugarcane bagasse was heated in a Parr reactor at a set temperature. The reactions were carried out at different temperatures (100-250) °C, catalyst loading (1% -10% KOH (m/v)) and reaction times (60 - 240 min) at 17 bar pressure. The solid and liquid fractions were then separated by vacuum filtration. The liquid fraction was analyzed for catechol using high-pressure liquid chromatography (HPLC) and characterized for the functional groups using Fourier transform infrared spectroscopy (FTIR). The optimized condition for catechol production was 175 °C, 240 min, and 10 % KOH with a catechol yield of 79.11 ppm. Since the maximum time was 240 min and 10 % KOH, a further series of experiments were conducted at 175 °C, 260 min, and 20 % KOH and yielded 2.46 ppm catechol, which was a large reduction in catechol produced. The HPLC peak for catechol was obtained at 2.5 min for the standards and the samples. The FTIR peak at 1750 cm⁻¹ was due to the C=C vibration band of the aromatic ring in the catechol present for both the standard and the samples. The peak at 3325 cm⁻¹ was due to the hydrogen-bonded phenolic OH vibration bands for the catechol. The ANOVA analysis was also performed on the set of experimental data to obtain the factors that most affected the amount of catechol produced.

Keywords : catechol, sugarcane bagasse, lignin, hydrothermal liquefaction

Conference Title : ICABBP 2023 : International Conference on Advances in Biofuels and Biofuels Production

Conference Location : Zurich, Switzerland

Conference Dates : January 16-17, 2023