ABSTRAK

Alexander Pasaribu, 4223240008 (2026), Sintesis Dan Karakterisasi Morfologi Biochar Tongkol Jagung Yang Diaktivasi Dengan Jeruk Nipis Dan Belimbing Wuluh Sebagai Material Elektroda Ramah Lingkungan.

Penelitian ini bertujuan untuk mensintesis dan mengarakterisasi morfologi biochar tongkol jagung yang diaktivasi menggunakan jeruk nipis dan belimbing wuluh sebagai aktivator alami ramah lingkungan pengganti aktivator kimia konvensional. Penelitian ini dilatarbelakangi oleh perlunya alternatif aktivator yang lebih ramah lingkungan serta pemahaman mengenai pengaruh jenis dan konsentrasi aktivator terhadap sifat morfologi, kimia, dan listrik biochar sebagai kandidat material elektroda. Biochar disintesis melalui karbonisasi pada suhu 450 °C selama 1,5 jam, kemudian diaktivasi secara kimia menggunakan ekstrak jeruk nipis dan belimbing wuluh dengan variasi konsentrasi, serta dilanjutkan aktivasi termal pada suhu 300 °C selama 1 jam. Sebelum aktivasi, dilakukan uji titrasi asam–basa untuk menentukan normalitas dan total keasaman aktivator. Hasil menunjukkan normalitas ekstrak jeruk nipis sebesar 0,53 N dengan total keasaman 33,92 g/L, sedangkan belimbing wuluh sebesar 0,25 N dengan total keasaman 16 g/L. Karakterisasi sifat listrik dilakukan melalui pengukuran resistivitas metode dua elektroda pada pelet silinder berdiameter 5 mm dan tebal 3 mm. Nilai resistivitas terendah diperoleh pada aktivasi jeruk nipis 30% sebesar 31,0 Ω·m dan belimbing wuluh 50% sebesar 34,5 Ω·m. Sampel terbaik dianalisis menggunakan Scanning Electron Microscopy dan Fourier Transform Infrared. Hasil menunjukkan peningkatan perkembangan struktur pori serta perubahan gugus fungsi setelah aktivasi. Jenis dan konsentrasi aktivator memengaruhi sifat morfologi, kimia permukaan, dan listrik biochar, dengan aktivasi jeruk nipis 30% sebagai kondisi optimal kandidat material elektroda berbasis karbon ramah lingkungan.

Kata kunci: Biochar, Jeruk nipis, Belimbing wuluh, , SEM, FTIR.

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ABSTRACT

Alexander Pasaribu, 4223240008 (2026), Synthesis and Morphological Characterization of Corn Cob Biochar Activated with Lime and Bilimbi as an Environmentally Friendly Electrode Material.

This study aims to synthesize and characterize the morphology of corn cob biochar activated using lime and bilimbi as environmentally friendly natural activators to replace conventional chemical activators. This research is motivated by the need for more environmentally friendly alternative activators, as well as an understanding of the effect of activator type and concentration on the morphological, chemical, and electrical properties of biochar as a candidate electrode material. Biochar was synthesized through carbonization at a temperature of 450 °C for 1.5 hours, followed by chemical activation using lime and bilimbi extracts with varying concentrations, and continued with thermal activation at 300 °C for 1 hour. Prior to activation, an acid–base titration test was conducted to determine the normality and total acidity of the activators. The results showed that the normality of the lime extract was 0.53 N with a total acidity of 33.92 g/L, while the bilimbi extract had a normality of 0.25 N with a total acidity of 16 g/L. The electrical properties were characterized by measuring resistivity using the two-electrode method on cylindrical pellets with a diameter of 5 mm and a thickness of 3 mm. The lowest resistivity values were obtained for lime activation at 30% (31.0 Ω·m) and bilimbi activation at 50% (34.5 Ω·m). The best samples were further analyzed using Scanning Electron Microscopy (SEM) and Fourier Transform Infrared (FTIR). The results indicate an improvement in pore structure development and changes in functional groups after activation. The type and concentration of activators influence the morphological, surface chemical, and electrical properties of biochar, with 30% lime activation identified as the optimal condition for environmentally friendly carbon-based electrode material candidates.

Keywords: Biochar, Lime, Bilimbi, SEM, FTIR.

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