

Modification of Pore and Surface Characteristics of Biochar Produced from Raw Tea Waste

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Abstract:

The main objective of this study is to determine the effectiveness of various activation methods on the characteristics on biochar characteristics. The feedstock for producing biochar was used raw tea waste (RTW) that is extensively produced in Turkey, a cheap and sustainable source. The biochar was physically modified by low-frequency ultrasound (US) waves, chemically treated with phosphoric acid (H_3PO_4), and functionalized by potassium hydroxide (KOH). Biochar with high surface area and microporous structure was obtained by pyrolysis at 500 °C with the treatment of H_3PO_4 . On the other hand, treatment with KOH led to the formation of meso- and macroporous structures along with the remaining functional groups on the surface. Before chemical activation, US treatment increased the surface area and permeability of samples by the formation of open pores. However, the duration of US treatment is critical. Namely, above 60 min US treatment, the pore walls of biochar become thinner and breakage occurs, resulting in decreasing surface area and pore volume. The biochar samples with different characteristics have great use potential in many areas such as catalyst, adsorption, energy storage.

Keywords: Biochar, Chemical activation, Raw tea waste, Ultrasound activation

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