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Preparation of Porous Bamboo Carbon by Low-Temperature Activation in Air

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Abstract: Bamboo carbon was prepared in N_2 flow for 2 hours at 500 °C with heating

rates from 7 °C/min to 39 °C/min, resulting in a BET surface area ranging from 28 to 252 m²/g, respectively. For the next step, the pore structure of the bamboo carbon was developed by air oxidation at 280 °C for 2 hours, comparing it with coconuts shell char activation. A BET surface area of 460 m²/g could be achieved for the bamboo carbon, but only 230 m^2/g for the coconuts shell char. When the air oxidation was conducted after de-ashing of the carbons with 1 mol/L HCl and 46% H_2F_2 solution, the surface area was as great as for the coconuts shell char containing ash. On the other hand, it was smaller for the de-ashed than for the untreated bamboo carbon. Based on the ash analysis, potassium was found to be the principal component for the bamboo carbon, but silicon, potassium and aluminum were detected in the coconuts shell ash. Examining air oxidation for mixtures of de-ashed coconuts shell char and potassium compounds (KOH, K₂CO₃, KNO₃, KCl), the highest BET surface area and total pore volume could be made by K_2CO_3 among the compounds. Hense, K₂CO₃ was estimated to play an important role for developing the pore structure of the bamboo carbon in the low temperature air oxidation.

Keywords: bamboo, carbonization, air oxidation, ash, potassium

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