Comparative of Potassium Hydroxide and Sodium Hydroxide Activation for Preparing Carbon from Natural Materials

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Activated carbon is a well-known porous material with high surface area and large pore volume, and is used widely in industrial applications such as gas storage, energy or electricity storage. The process of activation carbon with hydroxide has been known for a long time where potassium hydroxide (KOH) and sodium hydroxide (NaOH) are used for activation. Hydroxides are strong bases and they can react with most of the materials, even with relatively inert ones such as carbonous materials. This results a solid-liquid redox reaction under the carbonization process. The synthesis of porous carbon materials attracts great attention, many porous carbon materials in nanosized range (micropores, mesopores, or macropores) has been studied so far. Nettle stem and peanut shell are environment friendly materials and are used to prepare carbon in this work. They have natural cellulose structure which is appropriate to synthesize carbon materials. The properties of natural materials-derived activated carbon largely depend on the carbonization process. Experiments were conducted by using KOH or NaOH aqueous solution. The samples were prepared by pre-carbonization at 450 °C for 2 hours followed by activation with an aqueous solution of KOH or NaOH and carbonization at 800 °C for 2 hours under argon atmosphere. Activation with KOH aqueous solution resulted higher specific surface area (Brunauer-Emmett-Teller, BET) for both nettle stem and peanut shell (623 m^2/g and 993 m^2/g, respectively) than NaOH activation (1.4 m^2/g and 562 m^2/g, respectively). Morphology of the synthesized materials was investigated by Scanning Electron Microscopy (SEM) and show acicular, small flake and angular particles of the carbon structure.