In this study, heating methods and activation conditions were varied to investigate the applicability of activated carbon to adsorption heat pump (AHP) and desiccant humidity conditioner (DHC). Carbonaceous materials such as Phenol resin, Coconut shell, Coke, Plastics were used as raw materials. Various weight ratios of KOH to raw material were studied, as well as microwave (MW) and electric furnace heating. The initial period of MW heating (within 100 s) was found to be crucial in heating characteristics, with phenolic resin/KOH mixture being rapidly heated by absorption of MW energy by KOH.

Activated carbon prepared from the mixture was produced in a short time and the pore structure of the activated carbon was compared for microwave and electric furnace heating. For AC prepared at KOH/phenolic resin weight ratio 2:1, both phenolic resin/KOH mixture and potassium hydroxide were rapidly heated over 700 K within 240 s. Adsorbed water gradually and monotonically increased as relative pressure increased, with a steep increase at higher relative pressure. The adsorbed water content was over 600 K, with a temperature gradually increased with time to 800 K within 240 s. Regeneration was considered by heating for 3600 s (heating rate: 1 K/s) at 943 K (heating rate: 30 K/min).

Pore structure and effective water adsorptivity of ACs were studied using nitrogen adsorption isotherms and ethanol adsorption isotherms. BET surface area and micropore volume were calculated. The micropore volume of ACs prepared with slow electric furnace heating was higher compared to ACs prepared with microwave heating.

Both phenolic resin/KOH mixture and potassium hydroxide were rapidly heated over 700 K within 240 s, activated carbon was produced from the mixture in a short time. activated carbon was produced from the mixture in a short time. Adsorption isotherms showed a steep increase in water uptake at high relative pressure. The most typical type of water adsorption for AC.

Water vapor adsorption of ACs prepared was studied using a water vapor adsorption apparatus. Water vapor adsorption isotherms of activated carbon were obtained and the water vapor adsorption isotherm shape was similar to type IV of the IUPAC classification. A steep increase in uptake was observed at higher relative pressure. The most typical type of water adsorption for AC.

**Conclusion**

- Both phenolic resin/KOH mixture and potassium hydroxide were rapidly heated over 700 K within 240 s, activated carbon was produced from the mixture in a short time.
- For AC prepared at KOH/phenolic resin weight ratios, R, of 4 and at MW power, P, of 0.39 kW, S, and V reached maximum values of 2.280 × 10^4 m^3/kg and 1.559 × 10^4 m^3/kg, respectively.
- Activated carbon prepared under microwave heating at P=0.39 and 0.52 kW had high ratios of mesopore to total pore compared to ACs prepared with slow electric furnace heating.
- Activated carbon prepared at R=4 and at P=0.26 kW had 1.5 times higher effective water adsorptivity than desiccant humidity conditioner than a commercial silica gel.

**Applicability of AC by microwave heating to AHP & DHC**

- Water vapor adsorption isotherms of activated carbon showed a steep increase at higher relative pressure. The most typical type of water adsorption for AC.

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