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The pyrolysis of multi-component municipal solid waste in fixed bed reactor for activated carbon production

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Abstract:

The five representative components (pine wood, paperboard, waste tire, polyvinyl chloride (PVC) and acrylic textile) in municipal solid waste (MSW) were selected as raw materials to prepare the activated carbon. Single component, double component, and triple component mixture were pyrolyzed in a fixed bed reactor. The optimal preparation condition was acquired with a reaction temperature of 800 °C and reaction time of 60 min. The influence of different components on the adsorption performance of pyrolysis product was investigated under the optimum condition. Among the different single components, the pine wood showed the best adsorption capacity. As for the four kinds of double components mixture, the mixture of pine wood and tire showed the highest methylene blue adsorption performance. To approach the actual proportion of MSW, the triple components mixtures were further investigated. Four kinds of the triple components mixtures were pyrolyzed under the same preparation conditions under nitrogen atmosphere. The mixture of pine wood, tire and acrylic textile showed the best adsorption performance, which exhibited high surface area (646.32 m²/g) and pore volume (0.52m³/g), suggesting the potential application as adsorbent.

Keywords: Municipal solid waste; Pyrolysis; Fixed bed; Activated carbon.

Running title: Multi-component municipal solid waste based activated carbon

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