ADSORPTION CHARACTERISTICS OF SUBMICRON POROUS CARBON PARTICLES PREPARED FROM RICE HUSK

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Abstract

This study aims to investigate adsorption properties of submicron porous carbon particles prepared from rice husk. In the experimental procedure, to produce porous carbon particles, the following steps were done: (1) washing rice husk, (2) burning rice husk through two stages of heating process at temperatures of 200 and 600°C, (3) saw-milling process of the burned rice husk to obtain submicron sized carbon particles, and (4) porous structurization by dissolving the silica component from the saw-milled product using Sodium Hydroxide solution. Then, to analyze the adsorption properties, the prepared porous carbon particles were put into the curcumin solution under various conditions (i.e., initial amount of carbon, curcumin concentration, and adsorption time). Experimental results showed that although the prepared carbon particles were agglomerated, having sizes of about 800 nm, they were efficient for being used as an adsorbent. The analysis confirmed that the adsorption phenomena followed the Freundlich adsorption isotherm, describing the characteristics of multilayer and heterogeneous adsorption types. This is because of the existence of porous structure in the carbon adsorbent. This study demonstrates the importance of porous structures in the adsorption process, making the more adsorbate diffusion into the surface site and better adsorption efficiency.

Porous carbon material is one of the most unique and attractive materials because of its extraordinary characteristics, such as having a large surface area, high volumes of mesopore, and high electrostatic charge on the surface. These porous structure in the carbon have been found in microporous (less than 2 nm), mesoporous (between 2 to 50 nm) and macroporous ranges (more than 50 nm). Porous carbon has been widely applied as a protective mask of harmful gases, absorbs odors, fillers in rubber material, and catalysts. There are several ways to make porous carbon, such as sol-gel method and carbonization polymer. Although many reports have suggested various methods using various raw materials, most of the reports limited their study on the successful synthesis route. Almost no report discussed about what phenomena happen during the applications of carbon, specifically on the adsorption process. In fact, this information is important for practitioners, specifically when they want to apply this material for further uses.

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