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RESEARCH ARTICLE

STUDY OF DICAMBA ADSORPTION ON COCONUT SHELL BIOCHAR

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ABSTRACT

The adsorption of dicamba by coconut shell biochar (CSB) was investigated. The effect of initial concentration of dicamba was studied. The optimum concentration was 60 μg/mL. This suggested the strong interaction of dicamba with the CSB.Therefore, CSB, as a green, environmental-friendly adsorbent, can be applied to the adsorption of contaminants in environment.

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INTRODUCTION

In recent years, the circular economy concept is becoming an integral part of industrial green technological processes. Coconut shell biochar (CSB), which made from the byproducts of coconut shell, can also be used as an excellent adsorbent for removal of dyes, heavy metals and pollutants (Lin *et al.*2018).In this study, CSB was applied to adsorbdicamba. Effect of initial concentration of dicamba on adsorption was investigated.

EXPERIMENTAL

Chemicals and Materials: Dicambawas purchased from Sigma-Aldrich (Steinheim, Germany), high performance liquid chromatography-grade methanol (MeOH) and acetonitrile (ACN) were provided by J&K Chemical (Beijing, China). NaH_2PO_4, H_3PO_4, NaOH, and other affiliated chemicals were all obtained from Sinopharm Chemical Reagent Co. Ltd. (Shanghai, China). All solvents and chemicals were of analytical grade and used without further purification unless otherwise specified.

HPLC-grade water was obtained by purifying demineralized water in a Milli-Q system (Millipore, Bedford, MA, USA), and was used throughout the work.

Apparatus and software: Hitachi U-2910 UV-Vis spectrometer was provided by Hitachi Instrument Inc. (Hitachi, Japan). All the samples were passed through microporous nylon filters of 0.45 μm pore sizes in diameter (Pall Corporation, USA). An Ion 510 pH meter (Ayer Rajah Crescent, Singapore) was used to monitor pH adjustment. A centrifuge (Xiangyi, Hunan, China) was used for sample preparation.

Preparation of standard: Standard stock solution containing 1000 μg/mL of dicamba was prepared by dissolving the required amounts of the standard in MeOH. It was stored in a refrigerator at 4 °C. Working solutions were prepared from the stock solutions by dilution with appropriate amounts of Milli-Q water.

Adsorptive performance experiment: All the adsorption experiments were performed according to our previous work (Niu *et al.* 2022). The impact of initial concentration of dicamba adsorption efficiency was conducted by adding 100 mg CSB into each dicamba solution (pH=1, 5 mL) with

ultrasonic bath assisting for 0.5 h. The initial concentration of dicamba was between 10 μg/mL and 80 μg/mL and prepared by appropriately diluting the stock solution with 10 mmol/L NaH_2PO_4.

RESULTS AND DISCUSSION

Effect of initial concentration of dicamba: The initial concentration of analytes is crucial in understanding how the dicamba distribute on the CBS when the adsorption process reaches an equilibrium state. Figure 1 illustrates the effect of initial concentration of dicamba uptake by CSB ranging from 10 to 80 μg/mL. It could be found that *Q* of dicamba increased during the range of 10 to 60 μg/mL, then *Q* value decreased as the concentration increasing from 60 to 80 μg/mL. These phenomena may be because the surface of CSB was saturated when the initial concentration of dicamba was 60 μg/mL and could not provide more adsorption sites for more dicamba. If there were more dicamba, the competition between them would happen, then the Q value decreased.

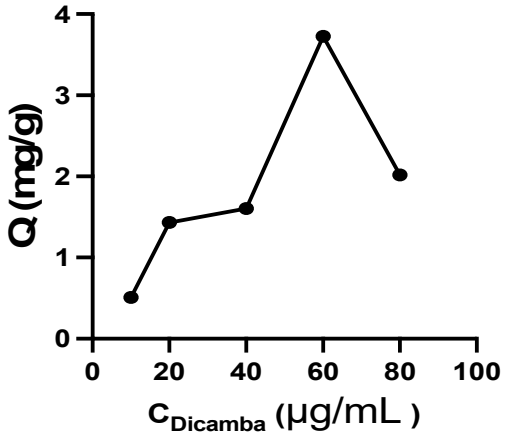

Figure 1. Effect of initial concentration of dicamba on adsorption

CONCLUSION

In conclusion, a green, environmental-friendly adsorbent was supplied to the dicamba adsorption. The data showed that when initial concentration of dicamba was 60 μg/mL, the adsorption reached an equilibrium. As a highly efficient adsorbent for dicamba, CSB could be a candidate to adsorb contaminants in environment in the future.

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