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Microwave assisted preparation of microporous activated carbon from *Siris* seed pods for adsorption of metronidazole antibiotic

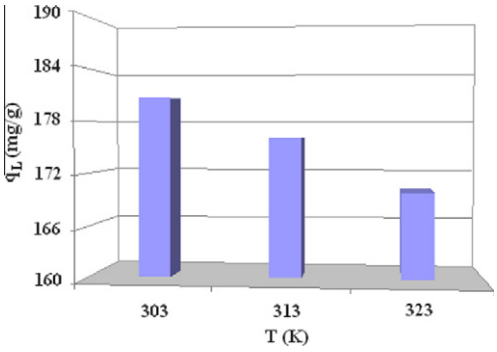
Muthanna J. Ahmed [a,b,*], Samar K. Theydan [b]

[a] Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia
[b] Department of Chemical Engineering, University of Baghdad, Baghdad, Iraq

HIGHLIGHTS

- Microporous carbon was prepared from *Siris* seed pods.
- Microwave technique was adopted for preparation using K_2CO_3.
- High surface area of 1676.16 m^2/g was characterized.
- Maximum capacity of 180.74 mg/g was reported for MNZ.
- MNZ kinetics data were well fitted by pseudo-second order model.

GRAPHICAL ABSTRACT



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ABSTRACT

In this study, *Siris* seed pods, an agricultural waste, were used as precursors for preparation of microporous activated carbon by microwave-assisted K_2CO_3 activation. The sorption of a nitroimidazole antibiotic, metronidazole (MNZ), onto such carbon has been investigated. Carbon with 74.44% micropores content has been prepared from these precursors. The performance of activation process was represented by the yield and iodine number of prepared carbon and the influences of radiation time, radiation power, and impregnation ratio have been studied. The adsorption data of MNZ were analyzed by Langmuir, Freundlich, and Dubinin–Radushkevich isotherms and the best correlation was achieved by the Langmuir isotherm with maximum capacity of 180.74 mg/g. The analyses of kinetic data showed that the adsorption of MNZ on prepared carbon follow closely the pseudo-second order kinetic model. Results of thermodynamic studies showed exothermic and spontaneous natures for adsorption of MNZ under examined conditions.

1. Introduction

Nitroimidazoles constitute a family of antibiotics that have been used in human and veterinary medicine to treat diseases caused by protozoans and bacterial infections [1]. Metronidazole (MNZ) is a first-generation member of 5-nirtroimidazole derivatives with high bactericidal activity against trichomonas, vincent's organisms, anaerobic bacteria, giardiasis, and amoebiasis [2]. MNZ has various effects on the human body. For instance, increasing its level has been found to be potentially carcinogenic and mutagenic [3]. It has been detected in hospital effluent wastewaters at concentrations of 1.8–9.4 μg/L [4]. Although the amount of MNZ in the aquatic environment is low, its continuous input may constitute in the long term a potential risk for aquatic and terrestrial organisms. Therefore, over the past few years they are considered to be an emerging environmental problem [5].

* Corresponding author at: Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Bangi 43600, Selangor, Malaysia. Tel.: +60 129177261.
E-mail addresses: muthanna.ja@gmail.com (M.J. Ahmed), samarkarim26@yahoo.com (S.K. Theydan).

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