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Study of preparation activated carbon from macadamia nut shells by chemical activation with H_2SO_4 in methylene blue treatment application

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ABSTRACT

Study on materials for treating Methylene Blue (MB) wastewater with bioactive activated carbon, prepared from Macadamia shell using H_2SO_4 activating agent. The research results showed that MB adsorption capacity reaches highest1g/250.22mgat optimal preparation conditions such as 50% H_2SO_4:coal = 1:1, temperature of 900^{0}C and 45 minutes firing time. Analysis of infrared spectrum diagram showed that activated carbon prepared from Macadamia shell with H_2SO_4 activating agent has functional groups - OH, carboxyl functional group C = O, group C - H in CH_3 and C link - H. Activated carbon from Macadamia shell with H_2SO_4 agent achieves the best Methylene Blue color treatment efficiency of 96.11%, corresponding to 201 Pt-Co color at optimal conditions such as pH = 6, dose 1g/L amount and 60 minutes processing time. The research results show that bioactive activated carbon is prepared from Macadamia shell and activated by H_2SO_4 can handle color in textile wastewater.

Introduction

Activated carbon is made from carbon-rich materials such as some kinds of fruit, timber, wood shavings, coconut shells,.. and other substances from coal mines (anthracite, peat, brown coal, semi-coke,...) or organic compounds (polymers, lignin, coal oil,...). Activated carbon has a large surface area (500 - 2500 m^2/g), which is mainly composed of 85-95% of carbon. Therefore, it is supposed to be the optimal substance to adsorb numerous types of pollutants [1].

Although Macadamia trees have been found in many parts of the globe in recent years, most of them are in Hawaii and Australia. In 1994, Macadamia trees were first cultivated in Ba Vi (Hanoi) for testing then they are now widely grown in many regions of Vietnam. It has been estimated that the area used for cultivating Macadamia trees will be up to 10,000 hectares by 2020 [2]. With one tonne of Macadamia seeds, 70-77% of shells will be produced [3].

Macadamia nut shells are high in cellulose (41.2%) [4], carbon (47 - 49%), oxygen (46.52%), hydrogen (6.10%), nitrogen (0.36%) and ash content is relatively low (around 0.22%) [5]; which proves that they are suitable materials for activated charcoal production.

Bioative activated carbon is producted from Macadamia peel using H_2SO_4 as activating agents. In addition, bioactive activated carbon was tested for Methylene Blue adsorption capacity in textile wastewater.

Experiment