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Methylene orange handling of cock cake casted by H_3PO_4 chemicals

by ***Dao Minh Trung, Nguyen Thi Tuyet Ngan, Nguyen Thanh Quang, Le Thi Dao, Trinh Diep Phuong Danh*** *(Thu Dau Mot University, Vietnam)*

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Corresponding author: trungdm@tdmu.edu.vn (Dao Minh Trung PhD)

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ABSTRACT

Survey of methylene orange wastewater treatment by activated carbon material prepared from macadamia husk with chemical activator H_3PO_4 shows that coal with the best methylene orange color treatment is achieved Optimal conditions such as pH = 5, coal dose 0.9 g/L and time 120 minutes. The results show that it is applicable to color wastewater treatment and the results are similar to other research results.

Key words**:** *Activated carbon H_3PO_4, Macadamia, adsorption, Methylene Orange.*

1. Introduction

Activated carbon is a form of treated carbon with small pores, small volume to increase the surface area for adsorption or chemical reaction. Activated carbon has a very large surface area of 500-2500m^2/g. According to Okman, Karagoz, Tay and Erdem (2014) activated carbon is widely used in many fields such as wastewater treatment, environmental recovery, removal of toxic gases in the air, remove color and improve groundwater. According to research by Le Huy Du et al., (1981), it is shown that activated carbon production materials usually have two main sources: coal and agricultural residues such as coconut fiber, rice husk and bamboo charcoal.

Macadamia trees are rare and dry fruit trees, grown from the North to the South of our country. Annually, the grain processing companies in Vietnam produce thousands of tons of seeds and release tens of thousands of tons of shells. Most of them are either discarded or burned.

Macadamia husks can make activated carbon when burned at high temperatures. Research results of Kwaghger and JS Ibrahim (2013) show that macadamia husk has a higher surface area than other types of nut shell, oxygen content (46.53%), Hidro (6.10%), Nitrogen (0.36%) and their ash content are very low (less than 1%). Therefore, macadamia seeds have great potential for making activated carbon.

Therefore, macadamia shell is used to make into activated carbon by chemical method using H_3PO_4 agent to investigate the ability of methylene orange color adsorption in textile wastewater.

2. Research methods

***Research facilities*:** (1) Study subjects: Methylene Orange (100ppm); (2) Research chemicals: H_3PO_4 (China, 98%), HCl 1N (China), NaOH 1N (China); (3) Research material: Macadamia husk is harvested in Lam Dong province.

***Experimental arrangement*:**

Experiment 1*: Preparation of activated carbon by chemical method using agent H_3PO_4*

Rocessing macadamia pods: smash, rinse; dry 110^oC for 48 hours.

Carbonization of Macadamia husk: temperature 350^oC; duration 60 minutes.

Activating coal: H_3PO_4: 1: 1 shaking ratio; heating temperature: 500^oC; Heating time: 60 minutes.

Experiment 2*: Surveying pH suitable for methylene Orange color treatment*

MO concentration: 100 mg/l according to Zhang, Liu, Wu and et al., (2018).

Survey of optimal treatment pH: MO treatment pH was surveyed in the range of 2 - 10 in the study of Gercel, Ozcan, Ozcan and Gercel (2007).

Experiment 3: *Surveying the appropriate dose of coal for the methylene Orange color treatment process*

MO concentration: 100mg/l according to Zhang, Liu, Wu and et al., (2018).

Investigate the optimal dose of treated coal: whether the amount of MO treated coal surveyed is 0.1; 0.2; 0.3; 0.4; 0.5; 0.6; 0.7; 0.8; 0.9; 1.0; 1.1 according to research by Gercel, Ozcan, A.S.Ozcan and Gercel (2007).

***Experiment 4**: Surveying the appropriate time for methylene Orange color processing*

MO concentration: 100mg/l according to Zhang, Liu, Wu and et al., (2018).

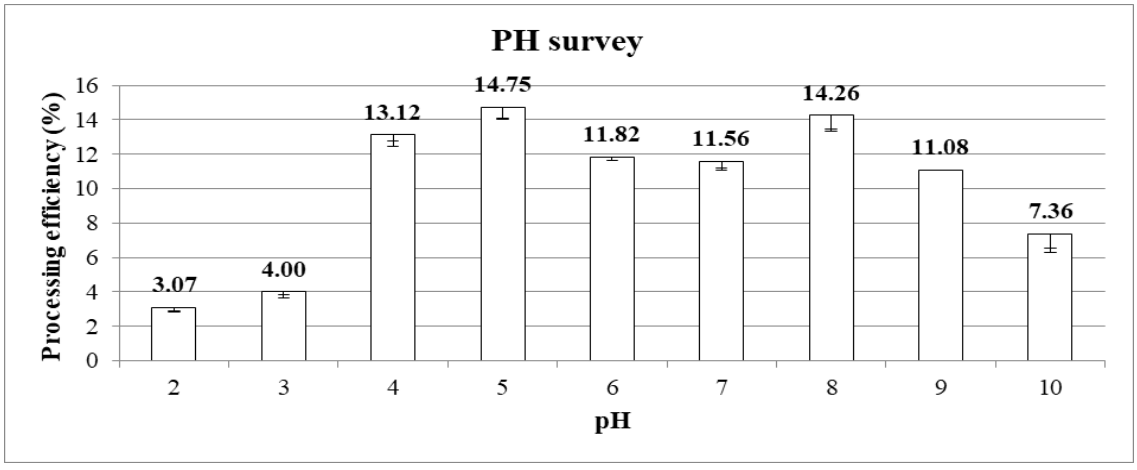
Investigation of optimal processing time: MO processing time surveyed is 0; ten; 20; 30; 40; 50; 60; 90; 120.

Evaluation methods:

- Determine the pH directly with a Mettler Toledo pH meter (2017).
- Determining MO color temperature according to TCVN 6185: 2005.
- Determination of adsorption index MB according to the standard GB/T 1249610-1999.

3. Results and discussion

3.1. Survey pH suitable for methylene Orange color processing

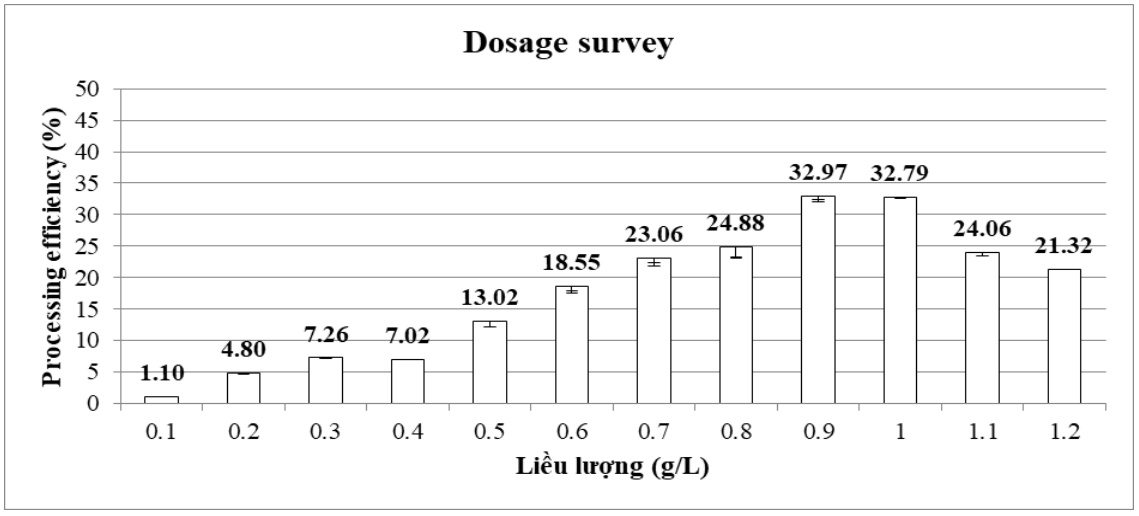


Form 1. The result of determining the optimal pH according to the adsorption of Methylene Orange

Research results on the ability to adsorb MO color from the research materials show that with the range of 4 - 8, the processing efficiency is quite high (13.12, 14.75, 11.82, 11.56 and 14.26%). The results obtained are capable of handling lower than other studies such as the results of Husseien, Amer, Maghraby and Taha (2007) on the absorption capacity of barley straw for solution containing color at pH = 11, effective treatment reached (74%) color processing.

Research results show that activated carbon prepared from macadamia husk with chemical activator H_3PO_4 has the best MO color treatment at pH = 5.

3.2. Survey of the appropriate dose of coal for methylene Orange color treatment

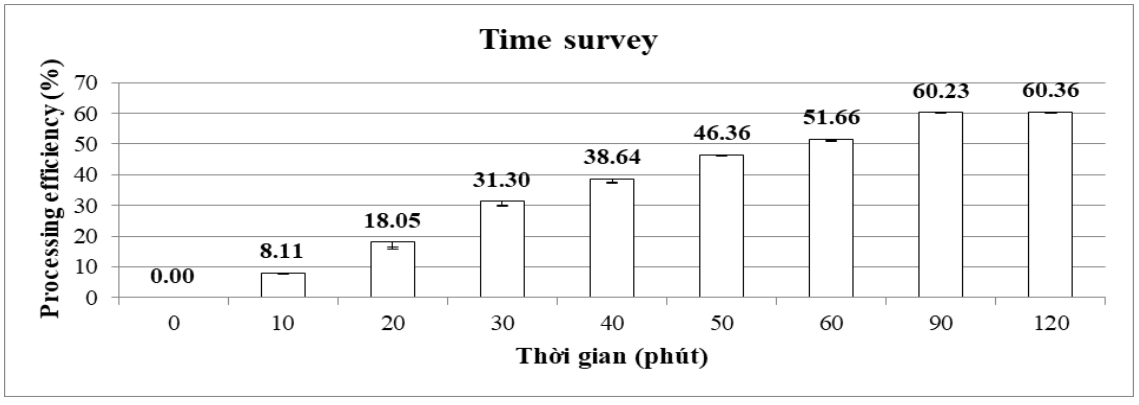


Form 2. The results determine the optimal dose according to the adsorption of Methylene Orange

Research results on the ability to adsorb MO color from the research materials show that with the range of 0.9 - 1g/l, the processing efficiency is quite high (32.97 and 32.79%, respectively). The results obtained with lower processing ability compared to other studies such as the result of using peanut shells to adsorb color to achieve the processing effect (95%) of Malik, Ramteke and Wate (2007) and research results for activated carbon. calculated from coconut husk by Daud and Ali (2004) at a dose of 0.3 g/l, treatment efficiency reached (91%).

Research results show that activated carbon prepared from macadamia husk with chemical activator H3PO4 has the best MO color treatment at pH=5 and the dose of 0.9g/l.

3.3. Surveying the appropriate time for the treatment of Methylene Orange color



Form 3. The result of determining the optimal time according to the adsorption of Methylene Orange

Research results on the ability to adsorb MO color from the research materials show that with the range of 90 - 120 minutes, the processing efficiency is quite high (60.23 - 60.36%). The results obtained with lower processing power compared to other studies such as the study of activated carbon from O. Gercel's Euphorbia Rigida, A. Ozcan, AS Ozcan and HFGercel (2007) showed that after 60 minutes of treatment, equivalent treatment efficiency is (98%) and research results on activated carbon from coconut shells of WMAW Daud and WSW Ali (2004) showed that after 180 minutes of treatment, treatment efficiency reached (90%).

Research results show that activated carbon prepared from macadamia husk with chemical activator H_3PO_4 has the best MO color treatment at pH = 5, dosages of 0.9g/l and time 90 minute.

4. Conclude

The results of determining the factors affecting the methylene orange color treatment process with bioactive coal prepared from macadamia husk with chemical activator H_3PO_4 showed that, with methylene orange wastewater At the level of 100 mg/l, at optimal conditions of pH = 5, the dosage of 0.9g/l and 90 minutes time can reach adsorption efficiency of (60.36%).

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