i-SPiKE 2023

INTERNATIONAL EXHIBITION & SYMPOSIUM ON PRODUCTIVITY, INNOVATION, KNOWLEDGE & EDUCATION

"Optimizing Innovation in Knowledge, Education and Design"

EXTENDED ABSTRACT

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Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality . I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

Professor Dr. Roshima Haji Said
RECTOR
UiTM KEDAH BRANCH

WELCOME MESSAGE (i-SPiKE 2023 CHAIR)

We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPiKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPiKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail
Chair
3rdInternational Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023)

AC-OP WATER FILTER

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ABSTRACT
Water is the source of life which is an invaluable natural treasure for all living organisms on Earth. Water is essential for residential, commercial, industrial, and agricultural consumers worldwide. Water was originally clean but the cleanliness and quality of water began to be contaminated due to human activities. Contaminated water can cause damage to the ecosystem and the sustainability of nature and even threaten human life because polluted water can cause various diseases. Globally, consumers not only confronted the water issue on the quality of water but also on the insufficient sources of clean water. Malaysia is the second largest exporter of palm oil in the world thus produces abundant of palm oil waste. Consequently, this project aims to explore the potential of activated carbon produced from empty fruit bunch (EFB) of palm oil waste as a water filter. The name of the innovation is AC-OP water filter which named after the activated carbon water filter made from oil palm waste. This is the conversion of agricultural waste into value-added product. Conventional steps were performed to produce the activated carbon where the EFB undergoes a pyrolysis process (pre- treatment), carbonization and activation before being utilized as water filter. A turbidity test was conducted to observe the potential of the activated carbon to filter the murky water. The findingsshow that the activated carbon from palm oil waste indeed has the potential to absorb impurities from the murky water. Further analysis can improve the abilities of the activated carbon oil palm-based waste as a water filter.

Keywords: activated carbon, oil palm waste, water filter, murky water, turbidity test

INTRODUCTION

Water crisis are worldwide. Typically, water crisis is neither the water shortage or poor water quality (Ling, T., 2021). The main contributor to the scarce freshwater resources globally could be the climate change, severe droughts, population growth, demand increase, and poor management (Salehi, M., 2022). Numerous alternatives taken to pull through the water crisis in order to supply adequate potable water to consumers. The high demands on domestic water

require consumers to use water even from murky water. Consumers also tend to store water to cope with the water shortage. These practices could pose crucial risks to the quality of the water. One of the efforts to ensure consumers devour potable water is the use of activated carbon point-of-use (POU) water purification (Mulhern et al., 2021 & Sangkarak et al., 2020).

The use of POU water purification is increasing due to the increasing demand of safe and clean drinking water. Typically, activated carbon (AC) is used as a filter in filter cartridges in filtration units of POU water purification devices to remove traces of organic compounds and micropollutants (Sangkarak et al., 2020). Filter cartridges used in water purification areusually replaced periodically to sustain the clean water supplied. Consequently, appropriate, and cost-effective filter cartridges need to be developed to conserve natural resources and make the use of POU water purification systems sustainable. A versatile porous adsorbent with a high surface area and adsorption affinity makes an AC one of the best materials available for removing pollutants from water and wastewater (Xie et al., 2019).

In this study, the potential of AC as water filter was invented from empty fruit bunch (EFB) of oil palm waste, therefore, known as AC-OP water filter. In Malaysia, oil palm plants are grown on over 9.6 million hectares of land, producing an extravagant amount of trash of about 95.3 million tons (Parthasarathy et al., 2022). Hence, this invention is to convert agricultural waste to value-added products. EFB of oil palm waste was cleaned and thereafter processed to produce the AC, subsequently tested to filter the murky water for turbidity test.

PROBLEM STATEMENT

The world's two largest producers of palm oil are Malaysia and Indonesia. The economic market for manufacturing plant-based oil from the oil palm tree (*Elaeis guineensis*) has grown in both nations. However, when palm fruit is processed to make oil, the fresh fruit bunches (FFB) are typically stripped of their contents, leaving empty bunches that are then thrown away as biowaste as empty fruit bunches (EFB)(Majesty & Herdiansyah, 2019). Malaysia's total oil palm planted area was 5.67 million hectares, and the country had 450palm oil mills with a combined annual processing capacity of 119.36 million tons of FFB in 2022 (Parveez, A. G., 2023). EFB is a common type of biomass waste and is abundant. It can cause a variety of problems, including water source pollution, pest attraction, greenhouse gas emissions, and soil acidification, posing a hazard to human life and the environment. Therefore, EFB needs to be managed and innovated from unused resources to a valuable substance such as activated carbon for use in clean water filtering.

OBJECTIVE

The main objective of this study is to investigate the performance of activated carbon (AC) based on oil palm waste as water filter.

METHODOLOGY

Empty palm fruit bunches (EFB) were selected to convert agriculture waste to value added product as study samples to produce activated carbon (AC). As shown in Figure 1, conventional steps were performed to produce the activated carbon which were the EFB

undergo pyrolysis process (pre-treatment), carbonization and activation, besides the large surface area gives AC its effectiveness as an adsorbing agent. The ideal pyrolysis temperature for the sample was 390ºC±15ºC and the carbonization time was 90 minutes.

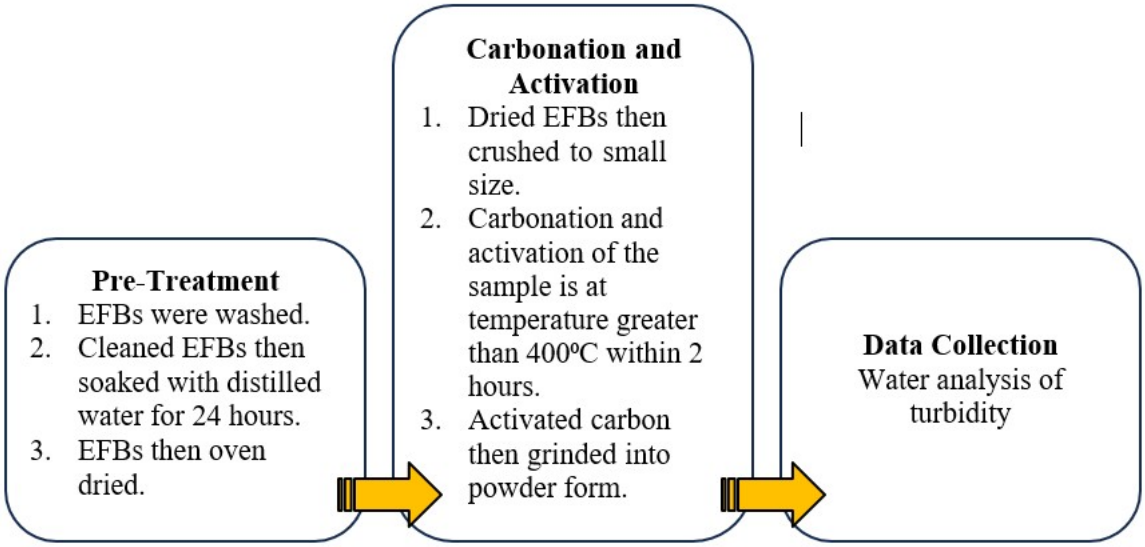

Figure 1. Flow chart of sample preparation.

In laboratory scale, the AC as water filter was determined via water analysis of turbidity. Turbidity test was measured by the light transmitting the water (Siong et al., 2013).

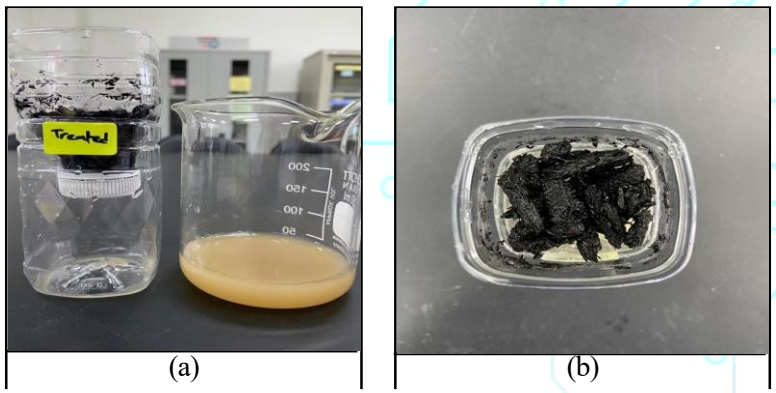

Figure 2. (a) Direct water filter kits and murky water sample. (b) Activated Carbon as water filter.

Figure 3. Turbidity observation for Activated Carbon as water filter.

Figure 3 depicts the observation of the murky water sample after it had undergone three AC filtration cycles. It was found that the turbidity of the murky water begun to clear in the second cycle and appeared to be getting clearer in the third cycle. This shows that AC based on palm oil waste has the potential to be used as a water filter either for water treatment or household water filter.

BENEFIT OF PRODUCT

The AC based on palm oil waste was produced using inexpensive and home-based method. Besides produce an AC in laboratory, our aims are this AC also can be produced at home. This will help to maximize the production of AC in order to reduce the abundant waste of this biomass.

Next, the conversion of EFB of oil palm into activated carbon was good for environment because it is a proper method to manage agricultural waste. It has the potential to be produced in large scale due its low production cost, high market demand and commercialize value. Currently, in online shopping application the price of activated carbon commercial isin range of RM20.00 to RM380.00 per kilogram.

In addition, the current water supply in Sabah was the major problem faced by citizen (Sakke, N et al., 2020). This requires the citizen to find or use alternative water for daily use, such as in Kota Belud, the resident use spring water as an alternative water (Tair, R. & Dell, L., 2018). On the other hand, the potential of AC based on palm oil waste as water filter will helpto improve the quality of water consumed by Sabahan.

CONCLUSION

The performance of the AC made from the EFB of oil palm as a water filter for the turbidity test on murky water shows that it has the potential to be developed either for water treatment or a household water filter. The development of AC from oil palm waste as a water filter is cost-effective and has high demand in the market due to its environmentally friendly material. AC provides the solution for water purification, decolorizing, odour removal and refining of murky water.

COMMERCIALIZATION

The potential of AC as a water filter made from the abundant waste of oil palm turns the conversion of biowaste into a value-added product. According to an online shopping observation, the price of activated carbon in the form of precursors varies with costs ranging from RM5.00 to RM30.00 for 500 g, or RM15.00 for 1.0 kg media water filters (Shoppe.com.my), and most of the majority of ACs come from China. Therefore, EFB-based AC has a high potential for commercialization at a lower cost because it is easy to obtain, and a significant amount is produced in our nation from waste into wealth.

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