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“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

3rd International Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023)

POPLASTY AC: DOMESTIC WASTE AS ACTIVATED CARBON FOR RIVER WATER TREATMENT

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ABSTRACT

The increase of domestic waste each year is a great concern. Furthermore, most of the waste is non-biodegradable which pollutes the ground and water. If decompose by burning, the air pollution occurred. Meanwhile, Malaysia is a nation rich with river but most of it were polluted. A few polluted rivers in the city were built shop, bridges and walkways decorated with the light by the government around it. Unfortunately, the dark colour of the river and its smell is still there. Thus, this project was conducted to turn the domestic waste that pollute the river water into activated carbon for river water treatment. There are three types of domestic waste used in this research which is paper, plastic and Styrofoam. All the domestic waste was turn into activated carbon and through four test which are smell, turbidity, pH, iodine, and biological oxygen demand (BOD) test. The result shown activated carbon from paper, plastic and Styrofoam is suitable to use as water treatment. Using activated carbon to treat river water hopefully will reduce the amount and cost to dispose of domestic waste, cost the river water treatment and a good effort as starting point to treat the river in our country. Keywords: activated carbon, water treatment, plastic, paper, Styrofoam

Keyword: mycoremediation, enzymatic degradation, mycelia, Pleurotaceae family

INTRODUCTION

Domestic waste is waste that generated because of the ordinary day-to-day use of a domestic premise such as food waste, papers, glasses, metals, plastics, textiles and so on. Malaysia generated about 38,699 tonnes of solid waste every day at least 1.17kg per person (StarMedia Group Berhad, 2020). As a result, over 80 percent of rivers in major cities in the country can be considered 'dead' and they are at the perilous level with rubbish, especially plastics and bottles causing the river water to turn black and emit a foul smell (Sinar harian, 2019).

Every year more than thousands of tourists come to Malaysia. Our government trying hard to beautify the city including the riverbanks around Klang, Gombak, Kinta, Melaka river and many more. A lot of restaurants that are built along the riverbanks with walkways. Next, the rivers are also decorated with various colorful lights to add more brightness in addition to beautifying the area. In addition, to bring tourists along the river, a few of river provides boat rental services.

The domestic waste causes the river water to be dark in color and produced the smells. A few rivers such as Sungai Klang and Sungai Melaka were taken care with a boat that collect the garbage in the river to control the pollution. Unfortunately, there is no action to treat the polluted river water in our country. Japan, German and a few countries started treating their polluted river a long time ago. Malaysia should start from now. May be the effort to treat the polluted river water will educate our citizen to love and care for the river more.

In an effort to reduce the amount and cost to disposal of domestic waste and treat the river as well to maintain and increase the number of tourists to come to Malaysia, this research was conducted. Activated carbon (AC) is a form of carbon processed to have a small, low volume pore that increase the surface area available for adsorption or chemical reaction (Igbemi Arthur Igbem et. al., 2021). Activated carbon are used to purify solutions of organic molecules containing unwanted colored organic impurities.

This project using activated carbon obtained from some of domestic waste which were found to have the highest rate of emissions by Malaysians which are paper, plastic, and Styrofoam. The product is considered as an environment- friendly since used domestic waste as a source to produce activated carbon. This research hopefully will reduce the amount of domestic waste, cost to decompose, cost for river water treatment and a good effort as starting point to treat the river in our country.

METHODOLOGY

There are two sections of procedure in this research which are the preparation of activated carbon and tests conducted for activated carbon from paper, plastic, and Styrofoam.

2.1 Preparation of activated carbon 2.1.1: Paper

About 15 grams of papers were dried under the sun for one hour. Then, the papers were heated and dried in the oven for about 5 hours on 105 oC. After that, the papers were grinded in a blender to high speed for about 1 minute to turn the paper into the granules. Next, the 100g paper granules were transferred into a 250 ml beaker. About 10 ml of citric acid from lemon juice was poured into the granule charcoal and left overnight. Subsequently, the carbon was rinsed repeatedly with distilled water and heated again at 105oC for 5 hours. Finally, they were microwaved at 160 Watts for 15 minutes to complete the activation process.

2.1.2 Plastic

For plastic, it was carbonated at a temperature of 480 oC for 2 hours using a furnace to form charcoal. Then, soaked in acetone for 24 hours. After that, it is filtered and dried using an oven at a temperature of 110 oC for 3 hours and continues with the process of physical activation at a temperature of 750 oC for 2 hours. Further, physics-activated carbon is chemically activated using KOH concentrations of 4M with a time variation of 2 hours because it shows the best result with an iod absorbency value of 980.17 mg/g, ash rate 0.28%, water level 7.55%, and volatile matter rate of 3.47%.

2.1.3 Styrofoam

The Styrofoam were developed at low-temperature process to turn it into base carbon form. This will produce up to 50% levels. Then, the base carbon was heated with reagents to get a 300 m²/g surface area.

2.2 Tests conducted for activated carbon from paper, plastic and Styrofoam

All the three types of activated carbon were uses as a filter of wastewater. The beaker contain 50ml wastewater was poured into each filter (filter funnel containing activated carbon wrapped by cotton). Four sample were produced which is non-treated wastewater, water treat byactivated carbon of paper, plastic, and Styrofoam before five tests were conducted.

First, the smell test was conducted by compare the smell of non-treated wastewater withthe other three sample. Secondly, turbidity test was done by place a piece of paper containing black dots under the beaker. Then, each beaker was observed from above to see the level of turbidity of each beaker. Thirdly, the pH test was done using pH paper. The pH paper was dippedinto water samples. Then the colour seen on the pH paper was compared with the colour scale toget the pH reading.

Next, iodine test was conducted by putting 2 ml of iodine in each beaker. Then, the solution was stirred and time to turns into clear water was recorded. Lastly, the Biologically oxygen demand (BOD) test was done by put 10 drops of 0.1M methylene blue in the sample. Then, the solution was stirred and time to turns into clear water was recorded.

RESULTS

Briefly, there are five tests that were done to examine which are the smell, turbidity, pH,iodine and BOD test. The results of the tests were shown in Table 1. The smell and turbidity testshown wastewater treated with activated carbon from Styrofoam is the best because less smellyand clearest compared to the other three sample. The pH test was conducted to examine the pH scale for each sample. The results for this pH test show that the wastewater treated with activated carbon from Styrofoam is neutral with pH 7 better than sample treated with activated carbon from plastic (pH 8) or paper (pH 10) in neutralize the pH sample while the sample that not filtered with activated carbon reach pH12.

Next the iodine test was conducted to determine the adsorption capacity of activated carbons. Based on the iodine test, activated carbon from Styrofoam only takes 1.5 hours to purifywater compared to active carbon for plastic which takes 10 hours, paper for 8.5 hours and pollution water for 20 hours. This prove that the activated carbon from Styrofoam is more effective to treat the river water. The last test is the Biologically Oxygen Demand (BOD) using methylene blue solution. This test also examines the clarity of the water. The result shows that activated carbon in Styrofoam takes the longest time (6 days) to turn the sample into clear waterwhich means the sample contain more oxygen compared to activated carbon from paper, plasticand non-treated wastewater which are 5, 4 and 3 days respectively.

Table 1

Sample	Test	Smell	Turbidity	pH	Iodine	BOD
Polluted Water		Strong	Unclear	12	20 hours	3 days
Treated with AC from Paper		Medium	Clearer	8	8.5 hours	5 days
Treated with AC from Plastic		Medium	Clearer	10	10 hours	4 days
Treated with AC from Styrofoam		Weak	Clearest	7	1.5 hours	6 days

CONCLUSION

Research findings show that activated carbon is a good innovation product for water treatment. This research proves that activated carbon from Styrofoam, plastic and paper can indeed lower the smell, turbidity and pH polluted water as well as purify water and neutralize water. Other than that, activated carbon can be regenerated, meaning that the "spent" carbon can be processed (usually in a rotary kiln) for reuse; adsorbed components can be absorbed, and the spent carbon is reactivated, allowing it to be reused over and over again. Finally, activated carbon helps keep the aquatic environment free of contaminants from the river. All this evidence has concluded that there is no doubt that activated carbon is the best material in the river water treatment process.

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