MELAKA INTERNATIONAL INTELLECTUAL EXPOSITION

MIIEX '24

12 JUNE '24

Dewan Taming Sari,
Universiti Teknologi MARA Caw. Melaka,
Kampus Alor Gajah, Melaka

"Empowerment of Special Needs through Invention & Innovation"

EXTENDED ABSTRACT

MiiEX'2024

MELAKA INTERNATIONAL INTELLECTUAL EXPOSITION 2024

"EMPOWEREMENT OF SPECIAL NEEDS THROUGH INVENTION AND INNOVATION"

UiTM Cawangan Melaka
KM26 Jalan Lendu,
78000 Alor Gajah
Melaka Bandaraya Bersejarah
Website: https://vmiiex.uitm.edu.my/

MiiEX'2024

MELAKA INTERNATIONAL INTELLECTUAL EXPOSITION 2024

"EMPOWEREMENT OF SPECIAL NEEDS THROUGH INVENTION AND INNOVATION"

EDITORSAND COMPILERS:

Dr Maimunah Johari

Puan Norlinda Tendot Abu Bakar

Puan Maymunah Ismail

Puan Nor Halawah Ahmad

Cik Afzan Shahilla Amir Hamzah

Puan Azira Rahim

COVER DESIGN:

Rashidy Samsudin

Wan Nur Khalisah Shamsudin

Ridzuan Adli bin Azidin

PUBLISHED BY:

UiTM Cawangan Melaka

KM26 Jalan Lendu,

78000 Alor Gajah

Melaka Bandaraya Bersejarah

Tel: +606-5582094 / 2190 / 2113

eISBN: 978-967-2846-81-9

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FOREWORD BY THE RECTOR OF UiTM CAWANGAN MELAKA

Professor Ts. Dr. Mohd Rasdi bin Zaidi

Rector, Universiti Teknologi MARA (UiTM)

Cawangan Melaka

Welcome to the Melaka International Intellectual Exposition 2024 (MIIEX ’24). It is an honour for me, on behalf of UiTM Cawangan Melaka, to thank all of you for joining MIIEX ‘24. We are proud to inform you that this is the 13th consecutive year that UiTM Cawangan Melaka is organizing this exposition. Since 2009, UiTM Cawangan Melaka has successfully hosted this innovation exposition. Not only have we succeeded in organizing the exposition, but we have also successfully embarked on commercialized products.

2024 is a special year where MIIEX 2024 emphasizes the development of special needs. As we know, special needs indicate a limitation in a person's ability to engage in and benefit from various aspects, such as daily activities and education. Hence, with the theme "Empowering Special Needs Through Invention and Innovation," it is a platform for industries, professionals, academicians, students, and communities to share their innovative ideas and products to increase accessibility for those with special needs.

The successful implementation of MIIEX ‘24 is our joint success. This event was supported by the Melaka state government through YB Datuk Fairul Nizam bin Roslan, the EXCO of Science, Technology, Innovation, and Digital Communication. I also want to express my

gratitude to Universitas Negeri Padang, Indonesia, Universitas Muhammadiyah, Makassar, Indonesia, the International Association of Economic and Businesses (IAEB), Universiti Sains Islam Malaysia, Ibnu Ummi Maktum Research Center (UMMI), USIM, and The Southeast Asia Minister of Education Organization Regional Centre for Special Educational Needs (SEAMEO SEN) as our co-collaborators for MIIEX 2024.

The collaboration from various parties in MIIEX ’24 is a platform that will improve cooperation and interweaving among industries, professionals, academicians, students, and communities in shaping their potential in developing innovation products. This exposition also serves as a platform to cultivate and uphold the nation’s innovation culture by presenting new ideas and research by young people, especially from academia and universities. Indirectly, MIIEX ‘24 will encourage all inventors towards empowering Science, Technology, Engineering, and Mathematics (STEM), especially in primary and secondary schools.

The new digital landscape also inspires more innovation and new ideas that contribute to various activities, such as business and industries. As a university that encourages “Research and Innovation,” we aim to foster more innovative products that benefit scholars, industries, and communities, addressing issues to improve our present and future life.

This exposition would never happen without dedication, teamwork, and commitment. A round of applause should be given to the committee teams, who are the backbone of this exposition. Their hard work, effort, and time made this exposition possible.

Finally, I would like to conclude this brief remark by thanking all the participants and stakeholders for joining the exposition. We hope that this collaboration never ends here.

Thank you.

FOREWORD BY THE DEPUTY RECTOR (RESEARCH & INDUSTRIAL LINKAGES)

Associate Professor. Dr. Nur Hayati binti Abd Rahman

Deputy Rector (Research & Industrial Linkages), Universiti Teknologi MARA (UiTM) Cawangan Melaka

With much passion and privilege, let me warmly welcome all of you to the Melaka International Innovation Exhibition (MIIEX), UiTM Cawangan Melaka's flagship event. I firmly believe that events such as these demonstrate the gradual evolution of this platform in terms of its significance and its governing principles within the sphere of learning and the broader scholarly society.

The theme for this year, "Empowering Special Needs Through Invention and Innovation," strongly connects to our mission of using research and technology to make a positive impact on the world we live in. Besides enforcing the message of diversity, this theme also reaffirms our focus on creating products to improve the lives of people with disabilities (PWDs). Such innovations are vital as only through focused constructive changes can society become more sensitive to the needs of all members.

MIIEX allows researchers, students, and industry professionals to come together, share their innovative research, and develop viable research partnerships. It has been great to see the enthusiasm of the participants and the efforts they put into their projects, which can offer various social and economic benefits. This is why one can state that MIIEX is a great

opportunity for creating connections between the academic environment and industry, facilitating the implementation of innovative and promising projects.

Finally, I would like to express my sincere appreciation to all the members and supporters of the organizing committee, all the participants, sponsors, and everyone involved in preparing this event. I want to express my gratitude for your commitment and involvement, as the success of MIIEX and the development of an active culture of innovation in our university and beyond is partly owed to your support.

Thank you

FOREWORD BY THE PROJECT DIRECTOR

Dr Zulkefli bin Muhamad Hanapiyah

Senior Lecturer

Assalamualaikum and Warmest Greetings,

It gives me a great pleasure, on behalf of the organizing committee, to welcome all participants and speakers to the Melaka International Intellectual Exposition 2024 (MIIEX '24) with the theme "Empowering Special Needs Through Invention and Innovation." We are honoured and pleased to welcome all participants to this biennial event.

MIIEX ‘24 is a platform that gathers experts from local and international industries, academia, scientists, researchers, and the community to contribute to the advancement of scientific and technological knowledge. This knowledge helps develop disruptive innovation products that improve daily activities for businesses and the community, especially those with special needs.

MIIEX '24 provides an atmosphere for inventors of all levels to gain new exposure and collaborate. Indirectly, this promotes a collaborative and innovative culture that focuses on cutting-edge technologies and new standards in technology and creativity.

MIIEX '24 is anticipated to serve as an arena for participants to acquire and disseminate revolutionary information on ideas and innovation. It is intended that the competition will expose the contestants' minds to the latest technologies and designs, aligning with the government's goal of encouraging innovation in Malaysia.

Finally, I want to compliment my fellow committee members on their amazing efforts, which were vital to the event's success. In addition, I want to thank our co-organizers, event sponsors, and participants. Optimistically, we hope that all new knowledge discovered, invented, or innovated will lead us toward future sustainability.

Thank you.

FOREWORD BY MELAKA STATE EXCO OF SCIENCE, TECHNOLOGY, INNOVATION AND DIGITAL COMMUNICATIONS

YB Datuk Fairul Nizam bin Roslan

Melaka State Exco of Science, Technology, Innovation and Digital Communications

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ABOUT MIIEX'24

MIIEX'24 is an innovation competition annually organised by UiTM Melaka with the intention to bring together ideas and inspiration that could fit in for commercialization needs. This event creates a platform for researchers to establish networking, partnership and opportunities to collaborate with industries.

OBJECTIVES

1. Encourage and instil passion towards inventing and innovating among UiTM Cawangan Melaka staff, students and academicians of local and international higher education institutions;

2. Highlight distinguished talents of skilful inventors and exhibit intellectual products, inventions and innovations among local and private tertiary institutions, government and private agencies, including international participants;

3. Become an effective Business Matching platform for participating research products, matching industries and partnering government agencies;

4. Recognise, inspire and promote invention and innovation products to be patented and commercialized;

5. Increase passion towards inventing and innovating through research and boost interests of government and non-government agencies to obtain consultancy services from a line up experts of higher education institutions and UiTM Cawangan Melaka.

THEME

'EMPOWERMENT OF SPECIAL NEEDS THROUGH INVENTION AND INNOVATION'

Transforming Corn Cobs into Renewable Coal: A Sustainable Alternative to Fossil Fuels

Muhamad faiz Azmi [1], Hazimmudin khair Jamaluddin [2], Hazrel hafiz Jamaluddin [3], Waffin wardah Norzelan [4], Mohamad nazmi Md nasoha [5]

[1,2,3]Faculty of Planting Management and Agrotechnology,UiTM Cawangan Melaka,Jasin Campus,Melaka,Malaysia .

Abstract

The depletion of fossil fuel reserves and the environmental consequences of their combustion have propelled the search for sustainable alternatives. This study investigates the viability of converting corn cobs, an abundant agricultural residue, into a renewable coal substitute. Through a series of experiments, the pyrolysis process is explored to transform corn cobs into solid fuel with properties akin to traditional coal. Parameters such as temperature, heating rate, and residence time are optimized to achieve high-quality coal-like material. Characterization techniques including proximate and ultimate analysis, scanning electron microscopy, and calorimetric tests are employed to evaluate the physical and chemical properties of the produced bio-coal. Additionally, environmental assessments are conducted to compare the emissions profile of corn cob-derived coal with conventional coal. Results indicate that the bio-coal exhibits promising calorific value, low ash content, and reduced emissions of greenhouse gases and pollutants compared to fossil fuels. Furthermore, economic analysis suggests the potential for cost-competitive production at scale, enhancing the feasibility of integrating corn cob-derived coal into existing energy infrastructure. This research underscores the transformative potential of utilizing agricultural residues to mitigate reliance on fossil fuels while addressing environmental concerns, thus contributing to the transition towards a sustainable energy future.

1. INTRODUCTION

The global quest for sustainable energy sources has intensified in response to the twin challenges of dwindling fossil fuel reserves and escalating environmental degradation. As the world seeks alternatives to mitigate climate change and ensure energy security, renewable energy technologies have emerged as crucial components of the transition. Among these, biomass-derived fuels offer significant potential due to their abundance, renewability, and relatively low environmental impact. In this context, the conversion of agricultural residues, such as corn cobs, into solid biofuels presents an enticing avenue for sustainable energy production. Corn cobs, a byproduct of the corn cultivation process, are abundant in many agricultural regions worldwide, making them an attractive feedstock for bioenergy production. Leveraging pyrolysis, a thermochemical process, to transform corn cobs into a coal-like substitute for fossil fuels represents a promising strategy to address both energy and environmental challenges.

Pyrolysis, the thermal decomposition of organic materials in the absence of oxygen, offers a versatile approach for converting biomass into various valuable products, including biochar, bio-oil, and syngas. The transformation of corn cobs through pyrolysis into a coal-like material holds particular significance, as coal remains a primary energy source for electricity generation and industrial processes globally. By harnessing the inherent energy content of corn cobs and transforming them into a denser, more energy-dense form akin to coal, this process could potentially mitigate the environmental impact associated with traditional coal mining and combustion. Furthermore, the utilization of agricultural residues for energy production can contribute to the circular economy by valorizing waste materials and reducing agricultural waste disposal burdens.

This study seeks to explore the feasibility and potential benefits of converting corn cobs into a renewable coal substitute through pyrolysis. By investigating the optimal conditions for pyrolysis and characterizing the resulting bio-coal's physical and chemical properties, this research aims to provide insights into the viability of corn cob-derived coal as a sustainable alternative to fossil fuels. Additionally, environmental assessments will be conducted to evaluate the emissions profile of the bio-coal and compare it with conventional coal, elucidating its potential environmental benefits. Through this investigation, we aim to contribute to the development of renewable energy solutions that address the dual imperatives of energy security and environmental sustainability.

2. OBJECTIVE

The initial goal of Transforming Corn Cobs into Renewable Coal is to switch to corn-based charcoal from ordinary charcoal. This is because we can produce charcoal more quickly and at a lower cost than we can with traditional methods. Because of the smoke from burning, another goal is to preserve the flavour of food cooked using corn charcoal. may alter the flavour and aroma of food.

3. NOVELTY &INVENTIVENESS

NOVELTY

Transforming corn cobs into renewable coal represents a novel approach with several innovative aspects:

the novelty of transforming corn cobs into renewable coal lies in its integration of agricultural waste utilization, renewable energy production, carbon sequestration potential, economic development, and technological innovation, offering a multifaceted solution to sustainability challenges.

Besides that, the novelty is from the aroma of the charcoal itself. Firstly is Selection of Washing and Filtering Processes: The washing and filtering process of corn charcoal after burning can help remove any unwanted odours and enhance the aroma produced. Secondly use in Food and Drinks: Corn charcoal that has an interesting aroma and is suitable for use in food and drinks can also be an added value. The pleasant aroma of corn charcoal may give a unique touch to processed food or served drinks.

INVENTIVENESS

The inventiveness of Transforming Corn Cobs into Renewable Coal is in terms of its advantages ie: the conversion of corn cobs into bio-coal presents an opportunity to valorize agricultural waste streams

- Effectively turning a byproduct of food production into a valuable resource for energy generation. This not only reduces waste disposal challenges but also creates new economic opportunities for farmers and rural communities. By integrating bioenergy production into agricultural practices, we can foster a more circular and resource-efficient approach to food and energy production.
- Use of bio-coal derived from corn cobs has the potential to improve energy security by diversifying the energy mix and reducing reliance on imported fossil fuels
- This localized energy production can enhance energy independence and resilience, particularly in regions where access to traditional energy sources may be limited or uncertain.
- promote sustainable land management practices

Corn cobs, when left unused in the field or disposed of through burning, can contribute to soil degradation and air pollution. However, by valorizing these agricultural residues for bio-coal production, farmers can adopt practices such as conservation tillage or mulching, which can improve soil health, reduce erosion, and enhance carbon sequestration..

4. PRACTICALTY & USEFULNESS

Transforming Corn Cobs into Renewable Coal has several different uses compared to regular charcoal:

Carbon Storage: Compared to normal charcoal, this helps keep carbon in the soil for a longer time. By lowering the atmospheric concentration of carbon dioxide, this lessens the greenhouse effect.

Soil Fertility: By giving soil microorganisms that support healthy plant growth a home, biochar increases soil fertility. It also facilitates plants' increased uptake of nutrients.

Water Filtration: Because biochar has strong adsorption qualities, it can be utilised to remove organic compounds and heavy metals from water.

Better Soil Structure: enhances soil structure by boosting air and water retention capacity and lowering leaching-induced nutrient loss.

5. CONCLUSION

In conclusion, the utilization of corn cob briquettes holds significant promise as a sustainable energy source, boasting multifaceted benefits across environmental, economic, and social realms. These briquettes not only provide a renewable alternative to traditional fossil fuels but also address agricultural waste management challenges by repurposing corn cobs, thus mitigating environmental degradation. Moreover, their production fosters local economic development by creating employment opportunities in rural areas and reducing dependence on imported energy sources, thereby enhancing energy security and resilience. Furthermore, the widespread adoption of corn cob briquettes could potentially alleviate energy poverty in underserved communities while reducing greenhouse gas emissions, thus contributing to global efforts towards combating climate change. However, realizing the full potential of this renewable energy resource requires sustained research, technological innovation, and supportive policy frameworks to overcome existing challenges and scale up production and distribution networks effectively. Through concerted efforts in research, innovation, and policy formulation, corn cob briquettes can play a pivotal role in transitioning towards a more sustainable and resilient energy future, wherein environmental, economic, and social imperatives are harmoniously addressed.

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