HOW TO INVESTIGATE THE PHYSICAL PROPERTIES OF ACTIVATED CARBON

Team Members:
Dafit Feriyanoto M.Eng. Ph.D NIDN: 118900633 (Leader)
Hadi Pranoto ST., MT., Ph.D NIDN/NIK: 114730437 (Member)

FIELD OF MECHANICAL ENGINEERING SCIENCE
UNIVERSITAS MERCU BUANA
2021
VALIDITY SHEET

1. **a. Title of Community Services**
   : How to investigate the physical properties of activated carbon

   **b. Previous Research Title**
   : The Development of Palm Shell Activated Carbon for Improving Indoor Air Quality

2. **Team Leader**
   a. Full name
   : Dafit Feriyanto M.Eng. Ph.D
   b. NIDN
   : 0310029004
   c. Functional
   : Tenaga Pengajar
   d. Faculty / Study Program
   : Faculty of Engineering / Mechanical Engineering
   e. Mobile phone number
   : +6281226452210
   f. Email Address (e-mail)
   : dafit.feriyanto@mercubuana.ac.id

3. **Team Member (Lecturer)**
   a. Number of Members
   : 1
   b. Name of Member I
   : Hadi Pranoto ST., MT., Ph.D NIDN/NIK: 114730437
   c. Name of Member II
   : Muhammad Ilham NIM. 41319210014
   , Muhammad Baehaqi NIM. 41319210022

4. **Student**
   a. Number of students
   : 2
   b. Name of Student I
   : Kembangan
   c. Name of Student II
   : Jakarta Barat/DKI Jakarta

5. **Location of Activity**
   a. Location/activity area
   : Universiti Tun Hussein Onn Malaysia (UTHM)
   b. City/Province
   : Jakarta Barat/DKI Jakarta

6. **Project Partner**
   : Physical properties of activated carbon

7. **Output produced**
   : 6 month

8. **Duration**
   : Rp. 7,500,000,-

9. **Sources of Expenditure**
   a. Source from PPM UMB
   : Rp. 1,000,000,-
   b. Source of funds from partner (in kind)
   : Rp. 8,500,000,-
   c. total

Jakarta, 11 December 2021

Signed by,
Head of Mechanical Engineering Department
(Muhamad Fitri, M.Si, Ph.D)
NIP/NIK: 118690617

Team Leader
(Dafit Feriyanto M.Eng. Ph.D)
NIP/NIK: 0310029004

Approved by,
Head of Research, Community Service and Publication Bureau
(Dr. Ir. Sawarni Hasibuan, MT)
NIP/NIK: 115650472
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<td>4.2. Budget from Partner</td>
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<td>9</td>
</tr>
<tr>
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</table>
CHAPTER I. INTRODUCTION

1.1. Situation Analysis
Activated carbon (AC) is a trade name for a carbonaceous adsorbent, which could be manufactured from a variety of carbonaceous material. The application of AC adsorption system has emerged and has been identified as one of the most effective sorbent media in the purification and filtration technology especially for the removal of VOC (Abechi et al., 2013). This sorbent material also has the potential to be used in respirable particulate matter removal (Muala et al., 2014).

AC has truly unique properties including large surface area, high degree of surface reactivity, universal adsorption effect, and pore size which is extremely effective at gases removal and chemical adsorption (Chambre, 2014). In the adsorption process, molecules of contaminated gas and chemicals are attracted to and accumulate on the surface of the activated carbon.

Commercial activated carbon is classified into three main categories depending on the product dimension such as Powdered Activated Carbon, Granular Activated Carbon and Pelletized Activated Carbon (Chew et al., 2013).

The pore structure of activated carbon is a one of parameter, apart from the particle size, that is believed to contribute immensely towards its large surface area. Pores or voids, which are connected to the external surface of a solid, are created during thermal decomposition of the organic precursors.

Pores are classified according to several criteria such as origin, state and size. First, for the origin of the pores, two types of pores are identified namely inter-particle and intra-particle pores. Whilst, inter-particle pores are based on how the primary particles stick together (aggregation or agglomeration) to form a secondary particle; intra-particle pores are based on the crystal structure of a solid or whether it is intercalated with atoms, ions or molecules. Second, for the state of the pores, two types of pores are distinguished as open or close. This state defines the pore if it adsorb gas upon exposure to an adsorbate gas or otherwise. The dimension of the diameter or radius of the pore is the third mode of classification as illustrated in Figure 1.1. Micro-pore (pore diameter < 2 µm), meso-pore (pore diameter; 2-50 µm) and micro-pore (pore diameter >50 µm) are the classification in accord to The International Union of Pure and Applied Chemistry (IUPAC) (Muala et al., 2014).
Amongst these criteria, the pore size is the most widely and commonly used. To achieve good pore structure and good adsorption properties, surface modification is needed for further pore development.

![Figure 1.1: Pore Size Distribution in Activated Carbon](image)

1.2. Purpose of Activities
Providing a coaching regarding to how to investigate the physical properties of activated carbon. The training will be more explore the certain areas about activated carbon, material, carbonization, green technology, air and water filter and its properties. This training also will educate the community in terms of the importance of activated carbon as air and water filter for improving their quality and it very potential in Indonesia due to Indonesia has abundant activated carbon feedstock from waste material such as palm shell, coconut shell and fiber shell.

1.3 Benefits
1. Improve the knowledge of community how to investigate the physical properties of activated carbon including moisture content, ash content, volatile content and fixed carbon.
2. Increasing the knowledge of community regarding to biomaterial technology that required to developed and sustained in order to improving air and water quality.
CHAPTER II. TARGET AND OUTPUT

2.1. Target

The solutions to be offered in this service are:

1. Provide guidance to community regarding how to investigate the physical properties of activated carbon including moisture content, ash content, volatile content and fixed carbon.

2. Provide manual book of fundamental of activated carbon including material, carbonization, green technology, air and water filter and its properties.

1.1 Output

The target outcomes to be achieved in this training are:

1. Scientific articles to be published in national journals

2. Service report

The planned performance targets can be seen in Table 2.1

<table>
<thead>
<tr>
<th>No</th>
<th>Types of Outcome</th>
<th>Indicators</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Scientific publication in the journal ISSN / proceedings</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Publication on printed / online / repository media at University</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Increased competitiveness (increase in quality, quantity, and value added of goods, services, product diversification, or other resources)</td>
<td>√</td>
</tr>
<tr>
<td>4</td>
<td>Increasing the application of science and technology in society (mechanization, IT, and management)</td>
<td>√</td>
</tr>
<tr>
<td>5</td>
<td>Improvement of community values (arts, culture, social, political, security, peace, education, health)</td>
<td>√</td>
</tr>
<tr>
<td>6</td>
<td>Publications in international journals</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Services, social engineering, methods or systems, products / goods</td>
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</tr>
<tr>
<td>8</td>
<td>New Innovation Appropriate Technology</td>
<td></td>
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<tr>
<td>9</td>
<td>Intellectual property rights (patents, simple patents, copyrights, trademarks, trade secrets, industrial product design, plant variety protection, protection of integrated circuit topographic designs)</td>
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<tr>
<td>10</td>
<td>ISBN book</td>
<td></td>
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</table>
CHAPTER III. IMPLEMENTATION METHOD

3.1 Implementation Method
The target participants will be consisting of at least 50 persons from the community that divided into several areas such as entrepreneur, scientist, student and targeted community. The community services activity will be conducted through webinar due to covid-19 issues. In the webinar will be invited several speakers which come from entrepreneur, scientist and from government in order to synchronize the program.

3.1.1 Implementation Time
Implementation is carried out for one day with the duration of the activity consists of 3-5 hours.

3.1.2 Implementation Location:
The activity will be carried out by webinar via Google Meet.

3.2. Preparation
1. Preparation of theory of physical properties of activated carbon
2. Preparing the activated carbon production kit
3. Prepare the activated carbon module for training

3.3 Materials Assistance
The material that will be delivered in this community service are:
• Part I. Basic of properties and parameter of activated carbon development.
• Part II. Introduction of physical properties of activated carbon.
• Part III. Application of activated carbon and its performance
3.4 Evaluation Method

The evaluation will be conducted after training activities and guideline delivered. The evaluation will be involved the training of how to investigate the physical properties of activated carbon including moisture content, ash content, volatile content and fixed carbon. The potential of activated carbon as air and water filter media in Indonesia will become a great chance to sustain the biomaterial production and it will indirectly contribute to the economic sector of Indonesia. Monitoring will be conducted within 6 months in order to ensure that the training is meaningful to related community.
CHAPTER IV. BUDGET AND SCHEDULE

4.1. Budget from UMB

The summary of the budget from UMB for how to investigate the physical properties of activated carbon is shown in Table 4.1 below:

Table 4.1 Details of UMB Fund Costs

<table>
<thead>
<tr>
<th>No</th>
<th>Component</th>
<th>Funds Proposed (Rp)</th>
</tr>
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<tr>
<td>1.</td>
<td>Instructor Honorarium</td>
<td>None</td>
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<td>2.</td>
<td>50 people snack during training</td>
<td>Rp. 2,500,000,-</td>
</tr>
<tr>
<td>3.</td>
<td>Transportation of participants</td>
<td>Rp. 2,500,000,-</td>
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<tr>
<td>4.</td>
<td>ATK</td>
<td>Rp. 500,000,-</td>
</tr>
<tr>
<td>5.</td>
<td>Photocopy of teaching material</td>
<td>Rp. 500,000,-</td>
</tr>
<tr>
<td>6.</td>
<td>Making proposals, initial reports &amp; final reports</td>
<td>Rp. 1,000,000,-</td>
</tr>
<tr>
<td>7.</td>
<td>Banners</td>
<td>Rp. 500,000,-</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>Rp. 7,500,000,-</strong></td>
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</table>

4.2. Budget from Partner

The summary of the budget from Partner for how to investigate the physical properties of activated carbon is shown in Table 4.2 below:

Table 4.2 Details of Partner Fund Costs

<table>
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<th>No</th>
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</thead>
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<td>Instructor Honorarium</td>
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</tr>
<tr>
<td>2.</td>
<td>Facility (Building, Projector, etc) for Socialization</td>
<td>Rp. 1,000,000,-</td>
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<tr>
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<td><strong>TOTAL</strong></td>
<td><strong>Rp. 1,000,000,-</strong></td>
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## 4.3 Activity Schedule

### Table 4.3 Time Schedule

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<tr>
<th>NO</th>
<th>Activity</th>
<th>Dec.</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Submission of proposals and presentations</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>UMB</td>
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<tr>
<td>2</td>
<td>Distribution of invitations to the target audience</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UMB</td>
</tr>
<tr>
<td>3</td>
<td>Implementation</td>
<td></td>
<td></td>
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<td></td>
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<td>UMB</td>
</tr>
<tr>
<td>4</td>
<td>Evaluation of implementation</td>
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<td></td>
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<tr>
<td>5</td>
<td>Report</td>
<td></td>
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REFERENCES


APPENDIX 1.

**CURRICULUM VITAE**

A. Personal identity

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<tr>
<td>1</td>
<td>Full name (include the title)</td>
<td>Dafit Feriyanto M.Eng. Ph.D</td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
<td>Laki-laki</td>
</tr>
<tr>
<td>3</td>
<td>Functional Position</td>
<td>Tenaga Pengajar</td>
</tr>
<tr>
<td>4</td>
<td>NIP/NIK</td>
<td>118900633</td>
</tr>
<tr>
<td>5</td>
<td>NIDN</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Place, Date of Birth</td>
<td>Banyuwangi, 10 Februari 1990</td>
</tr>
<tr>
<td>7</td>
<td>E-mail</td>
<td><a href="mailto:dafitferiyanto@mercubuana.ac.id">dafitferiyanto@mercubuana.ac.id</a></td>
</tr>
<tr>
<td>8</td>
<td>Phone Number</td>
<td>081226452210</td>
</tr>
<tr>
<td>9</td>
<td>Office Address</td>
<td>Meruya Selatan, Jakarta Barat, Indonesia</td>
</tr>
<tr>
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<td>Subject Taught</td>
<td>Heat Trabsfer, Fisika Listrik dan Magnet, Rekayasa produk</td>
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B. Education History

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<td>Material dan konversi energi</td>
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<td>Development of nanocrystalline Fe80Cr20 alloy using combination technique of ball milling and ultrasonic treatment for fuel cell interconnector</td>
<td>ultrasonic and electroplating approach for washcoat of γ-alumina and nickel oxide (NiO) catalyst on FeCrAl Substrate For catalytic converter</td>
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<tr>
<td>Name of Advisor/ Promotor</td>
<td>Achmad Jainuri ST. M.Eng</td>
<td>Assoc Prof. Dr. Maizlinda Izwana Bt Idris</td>
<td>Assoc. Prof. Dr. Abdul Mutalib Bin Leman</td>
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C. Research experience within 5 years (exclude thesis and dissertation)

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D. Community Service Activities within 5 years

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<th>Funding</th>
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<td></td>
<td>Amount</td>
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<td></td>
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<td>(Million Rp)</td>
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E. Academic Publication within 5 years

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<th>Title of publication</th>
<th>Type of publication</th>
<th>Volume/Nomor/year</th>
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<td>Effect of low current density and low frequency on oxidation resistant and coating activity of coated FeCrAl substrate by γ−Al₂O₃ powder</td>
<td>AIP Conference Proceedings</td>
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<td>MATEC Web of Conferences</td>
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</table>

F. Academic Oral presentation within 5 years

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<th>Time and place</th>
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<td>29-30 April 2017</td>
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<td>2</td>
<td>ENCON, 2016, Sarawak, Malaysia</td>
<td>Diffusion and Bonding Mechanism of Protective γ-Al₂O₃ on FeCrAl Foil for Metallic Three-Way Catalytic Converter</td>
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<td>------</td>
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<tr>
<td>1</td>
<td>Catalytic Converter and Its Application</td>
<td>2017</td>
<td>120</td>
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<td>2</td>
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G. Book Publication within 5 years

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<th>Type</th>
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H. HKI Acceptance within 5 years

I. Public Policy Composition / Social Enginerring Practices within 5 Years

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<th>Place of application</th>
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J. Awards Received within 10 years.

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<td>2</td>
<td>R&amp;I 2017, Silver medal</td>
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<td>2017</td>
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<tr>
<td>3</td>
<td>ITEX 2017, Gold medal</td>
<td>MINDS, Malaysia</td>
<td>2017</td>
</tr>
</tbody>
</table>

I hereby certify that the above information is true and correct to propose the the International Research Funding in Mercu Buana University. I agree that any misinterpretation made in this statement for the purpose of maintaining the rules and ethical conduct shall be grounds for any consequences.

Jakarta, 11 December 2021

(Dafit Feriyanto M.Eng. Ph.D)