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2021 5th INTERNATIONAL CONFERENCE

FIRST

FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY (FIRST)

CONFERENCE PROGRAMS AND ABSTRACT

ADVANCING SUSTAINABLE SCIENCE AND TECHNOLOGY THROUGH EFFECTIVE COLLABORATION

OCTOBER 20-21, 2021

Palembang, Province of South Sumatera
Indonesia

Organized By :

FOREWORD FROM GENERAL CHAIR 5th FIRST 2021 INTERNATIONAL CONFERENCE

Assalamu'alaikum wr wb,

Alhamdulillahirrobbil 'alamin, Thank to the God, almighty, due to His bless and love, we are granted good health and opportunity so that we can meet here in the event of the 5th FIRST and the 3rd SNAPTEKMAS 2021.
The honorable keynote speakers of the 5th FIRST and the 3rd SNAPTEKMAS 2021

Dra. Nana Yuliana, MA., Ph.D., as The Indonesian LBBP Ambassador for the Republic of Cuba, concurrently with the Commonwealth of the Bahamas, Jamaica, the Dominican Republic and Haiti
Prof. Ramaraj Boopathy. from U Alcee Fortier Distinguished Service Professor of Biological Sciences At the Nicholls State University, USA
Dr. Ing. Ahmad Taqwa, the Director of State Polytechnic of Sriwijaya.

The honourable keynote speakers, distinguished guests, all participants, ladies and gentlemen,

For the beginning of my speech, let me welcome all of you with my great warm hug. It is a great honor for me that you choose the 5th FIRST and the 3rd SNAPTEKMAS 2021 as your conference. I am so proud that the authors still become enthusiastic to develop the knowledge although in this pandemic situation. Let us still work hard to support the development of the world through the research, science, and technology in many parts of the knowledge, as what has been purposed by the FIRST conference itself.

In this occasion, I would like proudly to inform you that the 5th FIRST and the 3rd SNAPTEKMAS 2021 as the forum to share knowledge, to search, to find, and to enlarge the link with other industries and universities has attracted so many authors from abroad, such as from: Politeknik Tun Syed Nasir Syed Ismail; MARA University; Politeknik Mukah Sarawak; University Sultan Zainal Abidin, Terengganu, Malaysia; Politeknik Melaka (PMK) Malaysia; Iloilo Science and Technology University (ISAT-U) Philipina; Politeknik Kota Kinabalu; Universiti Teknologi Malaysia; The National University of Malaysia; National Chin-Yi University of Technology (NCUT); Accounting Research Institute UiTM-Malaysia; Management and Science University Malaysia; AlBaha University, KSA, Saudi Arabia; Politeknik Melaka (PMK), Malaysia; Kuantan Community College, Pahang, Malaysia; Universiti Brunei Darussalam; and Ferdowsi University of Mashhad, Iran.

Welcome to all of the researchers that become the collaborators in our research and community service. It is our great honour to have you as our collaborators and participants in the 5th FIRST and the 3rd SNAPTEKMAS 2021.

The honourable keynote speakers, distinguished guests, all participants, ladies and gentlemen,

In this chance, I would like to say thank you very much to the Director of State Polytechnic of Sriwijaya for his full support in the development of the Research and Service Community programs. Due to his hard work and his belief to all of the committee so that this event can be held.

In this occasion, I also would like to convey my big thank to all of the keynote speakers, invited guests, all the participants, all reviewers, and all committee of the5th FIRST and the 3rd SNAPTEKMAS 2021. Without you all, this event will be nothing. May Allah SWT gives His reward for your sincerity. As the time goes by, it is hoped that our cooperation and coordination in the FIRST and SNAPTEKMAS can be maintained and improved. I hope that you can enjoy this conference and can get a big benefit from this event. I also wish that we can meet again in the forthcoming FISRT ad SNAPTEKMAS

Wassalamu'alaikumwaraahmatullahi wabarakatuh

FOREWORD FROM DIRECTOR OF STATE POLYTECHNIC OF SRIWIJAYA

The honorable, FIRST 2021 and SNAPTEKMAS 2021 keynote speakers,

Dra. Nana Yuliana, MA., Ph.D., as The Indonesian LBBP Ambassador for the Republic of Cuba, accredited to the Bahamas, Republic of Dominican, Republic of Haiti and Jamica

Prof. Ramaraj Boopathy., from U Alcee Fortier Distinguished Service Professor of biological sciences at the Nicholls State University, USA

Dr. Ing. Ahmad Taqwa, MT., as Director of Politeknik Negeri Sriwijaya

Assalamualaikum wr wb,

Let us extend our gratitude to Allah SWT, the most gracious, the most merciful. Due to His bless, we can gather here, at the Opening Ceremony of the FIRST 2021 and SNAPTEKMAS 2021

First of all, Please let me deliver my warm welcome to all keynote speakers and all participant of FIRST 2021 and SNAPTEKMAS 2021. It is my great pleasure to meet and see you in this event.

Although, there are so many obstacles that should be faced in the pandemic situation, however, as young generation, we should be optimistic, stay strong and be active in searching and finding the solution. The FIRST 2021 and SNAPTEKMAS 2021 as the DIES of State Polytechnic of Sriwijaya annual event will become one of the media to support those activities. The researchers could share knowledge, find partners, and enlarge the collaboration through this event.

Based on the change in the model of the teaching learning activity that focuses on the MERDEKA BELAJAR, State Polytechnic of Sriwijaya has a big desire in getting acceleration in the internationalization of the institution. One of them by improving the overseas and industrial collaboration, especially in joint research and joint publication. In the beginning of 2021, the research and community service unit in Politeknik Negeri Sriwijaya has launched new schemes of research and community service, namely the Overseas Collaboration Research and Overseas Collaboration Community Service. Thanks to God, those schemes have attracted researchers not only from Asia but also several other countries outside Asia, such as: research and community service collaboration with Al Baha University from Saudi Arabia, with Ferdowsi University of Mashhad from Iran, and with Princess Sumaya University of Technology from Jordan, as well as several other foreign universities.

In this occasion, I also would like to welcome all the researchers that become the collaborators in our new scheme of research and community service. It is our great honour to have you as our collaborators.

The honourable participants,

At this time, State Polytechnic of Sriwijaya has held 5 times of FIRST. FIRST publications from previous conferences have been successfully indexed not only in SCOPUS, but also in WOS. This 5th FIRST seminar will be conjugated with the 3rd National Seminar on Community Service SNAPTEKMAS. (National seminar of applied technology for public). All of these are the efforts to improve the quality of Polsri lecturers which significantly have a positive effect on the learning process of Polsri students.

Before ending my speech, I would like to congratulate the participants of The FIRST 2021 and SNAPTEKMAS 2021. May the noble efforts, support, and cooperation of researchers in this conference will continue. Special thanks to the organizer and co-organizer committee of The FIRST 2021 and SNAPTEKMAS 2021 for the hard work and the commitment in realizing this conference. Do maintain the spirit of working in a team and continue to unite in order to display a culture of excellence in the eyes of the country and the world.

With Bismillahirrahmanirrahim, I officiate The FIRST 2021 and SNAPTEKMAS 2021.
Wassalamu'alaikum warrahmatullahi Wabarakatu

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KEYNOTE SPEAKER

Dra. Nana Yuliana, MA., Ph.D.

The Indonesian LBBP Ambassador for the Republic of Cuba, concurrently with the Commonwealth of the Bahamas, Jamaica, the Dominican Republic and Haiti

Her Excellency Ambassador Nana Yuliana, Ph.D arrived in Havana, Cuba on December, 23rd, 2020 to serve her duties as the Ambassador Extraordinary and Plenipotentiary of the Republic of Indonesia to Republic of Cuba, Commonwealth of Bahamas, Dominican Republic, Republic of Haiti and Jamaica. She was appointed by the President of the Republic of Indonesia on October 19th, 2020.Prior to her position as Ambassador Extraordinary and Plenipotentiary, she was Consul General of the Republic of Indonesia in Houston, Texas, United Stated of America from 2017 –2020, after she was the Director of Mid-Career Diplomatic School at the Ministry of Foreign Affairs of Indonesia from 2014 – 2017. Her first diplomatic assignment was as First Secretary of Political Affairs at the Embassy of Indonesia in Manila from 2001-2005. From 2008 to 2012, she was the Counsellor of Economic Affairs of the Embassy of Indonesia in Bangkok and Permanent Representative of Indonesia to the United Nations Economic and Social Commission for Asia and Pacific (UNESCAP). She attended several meetings related to Millennium Development Goals (MDGs) or Sustainable Development Goals (SDGs) issues. Her bachelor's degree was English Education from Institute of Teacher's Training in Jakarta, then she pursued her Master Degree in Applied Linguistics for Macquarie University in Sydney, Australia and also International Relations from University of Indonesia in Jakarta, Indonesia. She completed her Doctoral Degree in Development Studies from the University of Santo Tomas, Manila, Philippines in 2006. While serving as a diplomat since 1995, her passion in teaching and learning encourages her as well to share her knowledge and teaches at the University in Jakarta, Indonesia. During her tenure as Consul General, she was very active in promoting Trade, Tourism, Inbound and Outbound Investments and very keen to engage with Universities for cooperation in human capital development.

KEYNOTE SPEAKER

Prof. Ramaraj Boopathy

Alcee Fortier Distinguished Service Professor of biological sciences
at the Nicholls State University, USA

Fulbright Scholar Fulbright Senior Specialist World Class Professor-Government of Indonesia. Honorary Visiting Professor, ITB, Indonesia Alcee Fortier Distinguished Service Professor John Brady Endowed Professor in Biological Sciences Nicholls State University Business Address: Alcee Fortier Distinguished Service Professor John Brady Endowed Professor in Biological Sciences Department of Biological Sciences Nicholls State University Thibodaux **EDUCATION:** B.Sc. Zoology, University of Madras, India; 1979 M.Sc. Environmental Biology, Tamil Nadu Agricultural University, India; 1981 Ph.D. Environmental Biology, University of Madras, India; 1986 **UNIVERSITY RESPONSIBILITIES**: Responsibilities include Teaching Environmental Biotechnology, a Senior and Graduate lever course, Marine and Environmental Biology (Graduate Course), Microbiology and Environmental Biology courses. Research interests include Bioremediation of Hazardous Chemicals and Anaerobic Microbiology. Service includes advising students, participate in Departmental and University committees and serving the local and regional communities. Advisor to Masters Program in Marine and Environmental Biology. **PROFESSIONAL EXPERIENCE:** January 2013 – Present: John Brady Endowed Professor in Biological Sciences, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. August 2012 – Present: Alcee Fortier Distinguished Service Professor, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. August 2004 – Present: Distinguished Service Professor, Department of Biological Sciences, Nicholls State University, Thibodaux. Teaching, Research, and Service to the University and Community. **MAJOR AREAS OF RESEARCH INTERESTS:** Anaerobic digestion, Composting, Biodegradation of hazardous chemicals. Antibiotic resistant bacteria and Antibiotic resistance genes in the aquatic ecosystem. Isolation and identification of novel bacteria. Anaerobic degradation of explosive chemicals with particular reference to sulfate reducing bacteria. Design and development of biological reactor systems. Microbial immobilization of

heavy metals and radionuclides. Alcohol production from agricultural residues. Water quality in the wetlands. Alternative to sugarcane burning, Biological control of termites. Organic ways to control land loss and coastal restoration.

KEYNOTE SPEAKER

Dr. Ing. Ahmad Taqwa, MT.

Director of Politeknik Negeri Sriwijaya Indonesia

Director of State Polytechnic of Sriwijaya, other than that, he is still active at Head of The Research and Publication Commission Forum Director of State Polytechnical In Indonesia, Founder of The Online Journalist Board (IWO) Sumsel, Chairman of The Advisory Board of UKM Nusantara Palembang and Assessor of Higher Accreditation Board. **EDUCATION**: Diplom Ingenieur Electrical Engineering HTL, Ingenieurschule Beider Basel, Switzerland; 1994,Magister (2005) and Doctoral (2010) at Electrical Engineering, Bandung Institute of Technology, Indonesia. **RESEARCH**: Head of Research Assignment "Mini PLTS Periodic Cooling System to Overcome Overheating in Palembang City" (2019), Member of The Research Assignment "Effects of Sea Salt Dust Collection on Output Loss and Solar Panel Output Efficiency" (2020), and Head of Research Assignment "Design and Build of Wireless Sensor Network Prototype Detection Of Landslides Based on IOT and LORA" (2020). **DEDICATION:** "The Design and Evaluation of Virus Scan in The E-Mail System in SMA N 5 Palembang" (2018), Assignment Service "Utilization of WSN Technology in Parking Air Monitoring Foundation SMP Harapan Mulia Palembang" (2019), Development of Teaching Materials with Interactive Multimedia with Education Game for Harapan Mulia Junior High School Students" (2020). **AWARD:** Certificate In Participating In The 200 Hour Advanced Technical Teacher Training awarded by FONTYS and PEDC (1998), Satyalancana Karya Satya X Year 2011 And Satyalancana Karya Satya XX Year 2017 by The President of The Republic of Indonesia. **WORKSHOP**: Seminar and Focus Group Discussion Forum The Rector of Indonesia "Economic Stability In The Vuca Area", Ujung Pandang (2020), Workshop on Using Integrated Resources Information System Applications For Lecturers of State Polytechnical Polytechnic, Palembang (2019) And Workshop of Learning Methodology of Polsri Lecturers and Outside Education Domicile (PDD) as a Source Person, Palembang (2019).

RUNDOWN
The 5th FIRST 2021 INTERNATIONAL CONFERENCE
(FORUM IN RESEARCH SCIENCE AND TECHNOLOGY)
SNAPTEKMAS (Seminar Nasional Aplikasi Teknologi pada Masyarakat) 2021
Palembang, South Sumatera, Indonesia
Thursday, October 21, 20201

Thursday, October 21, 20201					
No.	**Session**	**Person in Charge**	**Time Allotment (WIB)**	**Liaison Officer**	
1.	Registration	Event Section Committee	07.00 – 08.00	Doeslohal Djumrianti, S.E.MIS., Ph.D	
2.	The Opening Ceremony	Event Section Committee	08.00 – 09.00		
3.	Do'a				
4.	Indonesian National Anthem				
5.	Chair Report Speech				
6.	Speech and Opening Remarks by Director of State Polytechnic of Sriwijaya				
7.	Souvenirs Gift, Group Photos				
PLENARY SESSION					
No.	**Keynote Speaker**	**Affiliation**	**Time Allotment (WIB)**	**Moderator**	**Liaison Officer**
1.	Dra. Nana Yuliana, MA., Ph.D.	The Indonesian LBBP Ambassador for the Republic of Cuba, concurrently with the Commonwealth of the Bahamas, Jamaica, the Dominican Republic and Haiti	09.00 – 10.00	Tiur Simanjuntak M.Pd.	Doeslohal Djumrianti, S.E.MIS., Ph.D
2.	Prof. Ramaraj Boopathy	Alcee Fortier Distinguished Service Professor of biological sciences at the Nicholls State University, USA	10.00 – 11.00	Prof. Hasan Basri	Dr. Nyayu Latifah Husni, M.T.
3..	Dr. Ing. Ahmad Taqwa, MT.	Director of Politeknik Negeri Sriwijaya, Indonesia	11.00 – 12.00	Jaksen M. Amin, M.Si.	Dr. Martha Aznury, S.Pd., M.Si.

PARALEL SESSION					
No.	**Theme**	**Room**	**Time**	**Moderator**	**Articles**
1.	TRACK 1 (Engineering and Science)	1	13.00 – 16.00	Dr. Eng Tresna Dewi, M.Eng./ Ika Sulianti, ST, MT	15
2.	TRACK 1 (Engineering and Science)	2	13.00 – 16.00	Dr. Martha Aznury, M.Si./ Indah Purnamasari, M.Eng.	14
3.	TRACK 1 (Engineering and Science)	3	13.00 – 16.00	Fatahul Arifin, M.Eng, Ph.d./ Dr. Indrayani, S.T., M.T.	13
4.	TRACK 2 (Computer Science, Computer Engineering, Information System, Informatics Management)	4	13.00 – 16.00	Rika Sadariawati, M.Si./ M.Miftakhul Amin, S.Kom., M.Eng	13
5.	TRACK 2 (Computer Science, Computer Engineering, Information System, Informatics Management)	5	13.00 – 16.00	Dr. Nyayu Latifah H, MT./ Lindawati, S.T., M.TI	12
6.	TRACK 3 (Social Science)	6	13.00 – 16.00	Doeslohal Djumrianti, S.E.MIS., Ph.D/ Dr. Marieska Lupikawati	13
7.	TRACK 3 (Social Science)	7	13.00 – 16.00	Dr. Sari Lestari ZR/ Dr. Rita Martini	14
8.	SNAPTEKMAS 1	8	13.00 – 16.00	Yurni Oktarina, ST, MT/ Mouland Irwadi, SE. M.Si.	15
9.	SNAPTEKMAS 2	9	13.00 – 16.00	Leni Novianti, M.Kom./ Maivi Kusnandar, M.Kom	15
10	SNAPTEKMAS 3	10	13.00 – 16.00	M Husni Mubarok, M.Si./ Martinus Mujur, ST, MT	15
11	SNAPTEKMAS 4	10	13.00 – 16.00	Dr. Ade Silvia H, MT./ M. Sopian Soim, ST, MT	13

CLOSSING SESSION		
Event	Time	Room
– Closing Ceremony – Announcement of: 1. Best Paper FIRST IC 2021 2. Best Paper SNAPTEKMAS 2021 3. Best Presenter FIRST IC 2021 4. Best Presenter SNAPTEKMAS 2021 – Quiz Online	16.00– 17.00	Main Room

TRACK 3 (Social Science)

ROOM : 6
TIME : Thursday, 21 October, 2021/ 13.00 - 16.30
ARTICLES : 13
MODERATOR : Doeslohal Djumrianti, S.E.MIS., Ph.D/ Dr. Marieska Lupikawati

NO	Time	ID	AUTHORS	TITLE	AFFILIATION
1	13.00-13.10	3847	Ayu Chotibah, Bainil Yulina, Desi Apriyanty, Evada Dewata, Pridson Mandiangan	THE INNOVATION OF SOUTH SUMATERA TRADITIONAL BATIK E-COMMERCE APPLICATIONS	State Polytechnic of Sriwijaya
2	13.10-13.20	3683	M. Thoyib, Riza Wahyudi, Firmansyah, Darul Amri	THE ANALYSIS OF COST QUALITY ON PRODUCTIVITY OF IRON RAILING PRODUCTS IN SMALL AND MEDIUM BUSINESS IN PALEMBANG	State Polytechnic of Srwiwijaya
3	13.20-13.30	3757/3756	Nelly Masnila, Firmansyah, Jovan Febriantoko, Riana Mayasari, Jamaliah Said	Quality of Financial Reporting and Impact of GGG Implementation: Study on Local Government in Indonesia	State Polytechnic of Sriwijaya
4	13.30-13.40	3796	Evi Agustina Sari, Sri Gustiani, Yusri, Tiur Simanjuntak	An Error Analysis of English Sentence Construction in Writing Subject Made by the Students of the English Department at Sriwijaya State Polytechnics	State Polytechnic of Sriwijaya
5	13.40-13.50	3827	Edwin Frymaruwah, Farah Aida Ahmad Nadzri, Periansya, Evada Dewata	DISCLOSURE OF SUSTAINABLE PERFORMANCE IN HIGHER EDUCATION IN INDONESIA	State Polytechnic of Sriwijaya, UiTM
6	13.50-14.00	3976	Hendra Hadiwijaya Febrianty Rezania Agramanisti Azdy	Improvement of LPKA Class 1 Palembang Electronic Dashboard with Field Performance Monitoring	Palcomtech Polytechnic, STMIK PalComTech
7	14.00-14.10	3853/4034	Neneng Miskiyah, Purwati, Yulia Pebrianti, Keti Purnamasari, Nyimas Miftahul Jannah,	OPTIMIZATION OF INCOME PARAMETERS OF SONGKET CRAFTSMEN ON KOPERASI SONGKET PALEMBANG	State Polytechnic of Sriwijaya

Table of Contents

Eucalyptus pellita Actived Carbon for Fe Absorption Effect of Carbonization Temperature and Concentration of KOH Activator

Leila Kalsum[1,*], Idha Silviyati[1] Jenie Fahlevi Putri[1]

[1] *Department of Chemical Engineering, Sriwijaya State Polytechnic, Bukit Besar, Palembang 30139, Indonesia*
[*] *Corresponding author. Email: leila_k@polsri.ac.id*

ABSTRACT
Eucalyptus pellita bark is a waste from the pulp industry that can be used as a raw material in activated carbon manufacturing because it contains high enough cellulose, hemicellulose, and lignin. This study aims to determine the effect of various carbonization temperatures and KOH activator concentrations on Fe absorption in water. Making activated carbon procedure consisted of dehydration, carbonization, and activation. Furthermore, the analysis of activated carbon characteristics was based on Fe absorption. The variations of this study consisted of carbonization temperature, 250ºC, 300ºC, and 400ºC, and variations of KOH activator concentrations, 0.2 N, 0.7 N, and 1.2 N. The best-Eucalyptus pellita bark activated carbon obtained for carbonization temperature at 350ºC and an activator concentration at 1.2 N with the value of Fe^{2+} absorption was 95.343%.

Keywords: *Activated carbon, Eucalyptus pellita bark, adsorption, potassium hydroxide.*

1. INTRODUCTION

Like other chemical elements, heavy metal elements are also needed by living organisms in various metabolic processes for the growth and development of body cells. For example, iron (Fe) is needed for the manufacture of hemoglobin. But heavy metal elements in excessive amounts will be toxic [1]. Toxicity of heavy metals depends on the type, concentration, synergistic-antagonist effect and physic-chemical form. The greater the heavy metal content, the greater the toxicity [2].

The presence of dissolved iron in water causes the water to become red, yellowish, smells fishy and forms an oil layer [3]. Drinking water with high iron content can cause nausea when consumed and is very dangerous for health, so it is necessary to reduce iron levels in the water. One method that can be used to reduce the iron content in water is the adsorption method. The process of mass transfer on the surface of the pores on the adsorbent granules is known as adsorption. Liquid-solid and gas-solid are the boundary between two phases that mass transfer occurs [4]. A solid material with a very large internal surface area is called an adsorbent. This large surface is formed due to the many fine pores in the solid [4]. One of the adsorbents known to many people is activated carbon.

Activated carbon is very good at absorbing harmful substances in water. In Indonesia, the need for activated carbon in the industrial sector is still relatively high due to being widely used in the industrial sector [5]. Activated carbon is charcoal with a microcrystalline or amorphous structure that mostly consists of free carbon, and has an internal surface, with a surface area ranging in 300-2000 m^2/gr [6]. Activated carbon can be used in filters, which absorb odors, reduce water color intensity, absorb odors, and absorb metals [7]. Activated carbon is usually produced from natural materials containing lignocellulose, namely cellulose, lignin, and hemicellulose. [8]. Judging from the abundant natural resources in Indonesia, it is very possible that the need for activated carbon can be met from domestic production [9]. One of the natural ingredients is eucalyptus *pellita* bark waste produced by the pulp and paper industry.

The methods used in this research have followed some steps, namely bark dehydration, carbonization, and chemical activation. The dehydration process occurs using an oven at 100ºC for heating until obtaining a constant weight. Dehydration aims to acquire dry and pure material and facilitate the carbonization process. The process of carbonization or composing was carried out by heating the raw materials using a furnace. Carbonation (combustion) is an incomplete pyrolysis (burning) process with limited air from carbon-containing materials. In this process the formation of the pore structure began. This process aimed to produce granules that have absorbancy and a neat structure. In the carbonation process there was shrinkage of the sample. It was because the heating given during the carbonation process removed the particles contained in the sample so that only palm frond charcoals remain [10]. The activation process is a process that breaks hydrocarbon bonds or oxidizes surface molecules so that the charcoal changes properties, both chemical and physical, that is a treatment of charcoal that aims to enlarge the pores, the surface area increases and affects the adsorption power [11].

In this study, carbonization was carried out at various temperatures of 300^0 C, 350^0 C and 400^0 C. The solid material left after carbonization was carbon in the form of charcoal with narrow pores. Furthermore, the carbon was activated chemically by using various activators of KOH 0.2 N, 0.7 N and 1.2 N. KOH is a good activator to expand the surface of the adsorbent. So it increases the absorption of harmful substances. This study aimed to analyze the effect of carbonization temperature and KOH activator concentration on the absorption of iron metal in water.

2. RESEARCH METHOD

This research method is divided into three parts, namely materials and tools, research procedures, and Fe2+ absorption analysis.

2.1. Materials and Instruments

The material used in this study was Eucalyptus *pellita* bark waste obtained from *PT. Tanjungenim Lestari Pulp and Paper* in *Empat Petulai Dangku District, Muara Enim Regency*. Other materials used include *Aquades*, KOH 0.2 N , 0.7 N and 1.2 N, HCl 0.1 M. Other materials and instruments used including analytical balance, 70 mesh sieve, filter paper, oven, furnace, desiccator, Porcelain cup, Crucible cup, Stirrer, 250 ml and 500 ml beakers, Volumetric flask, Measuring cup, Spatula , and Watch glass

2.2. Research procedure

2.2.1 Activated Carbon Production

1. Samples were dried using an oven at a temperature of 110^0 C.
2. Raw materials were carbonized for 30 minutes using a furnace (there were variations in carbonization temperature, namely 300^0 C, 350^0 C and 400^0 C.
3. The raw materials were grinded using a grinder and sieved with a 70 mesh sieve shaker.
4. 20 grams of raw materials were mixed into 100 ml of activator solution (there were variations in the type of activator, namely KOH 0.2 N, 0.7 N and 1.2 N. This activation process was carried out for 24 hours.
5. Activated carbon was washed with distilled water and filtered to obtain a pH of 7.
6. Activated carbon which had been neutral then dried for 1 hour using an oven at a temperature of 110ºC.

2.2.2 The Analysis of Fe^{2+} Absorption Testing by Eucalyptus Pellita Bark Activated Carbon

1 gram of activated carbon was weighed and mixed with 100 ml of 20 ppm Fe solution. The sample was then stirred for 60 minutes using a stirrer. The mixture was then filtered using filter paper to take the filtrate. The filtrate was then tested for iron content using Atomic Absorption Spectrophotometer (AAS), namely the SNI method 06-6989.4-2004 [12] in the Laboratory of Analytical Chemistry Instruments. The concentration of Fe metal that was absorbed by activated carbon that calculated by the equation:

$$\text{Absorbed Fe Metal Level} = \frac{C1-C2}{C1} \text{x } 100\% \quad (1)$$

Annotation:

C1 = Initial concentration of solution (ppm)

C2 = Solution concentration after contact with activated carbon (ppm)

3. RESULTS AND DISCUSSION

Determination of the absorption of iron aims to determine the performance of activated carbon against harmful metals such as iron. The method used was the light of atom absorption. Depending on the nature of the elements, the atoms absorb the light at specific wavelengths. To determine the sample density (ppm)

compared to the peak height of the sample and the standard.

3.1 The Effect of KOH Activator Concentration and Carbonization Temperature on the Absorption of Iron (Fe) in Water

The effect of KOH activator concentration and carbonization temperature on iron absorption can be seen in Figures 1 and 2 as follows.

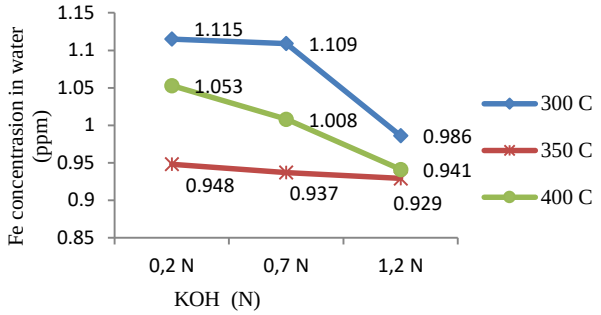

Figure 1 The Effect of KOH Activator Concentration and Carbonization Temperature on the Decrease of Fe Concentration in Water

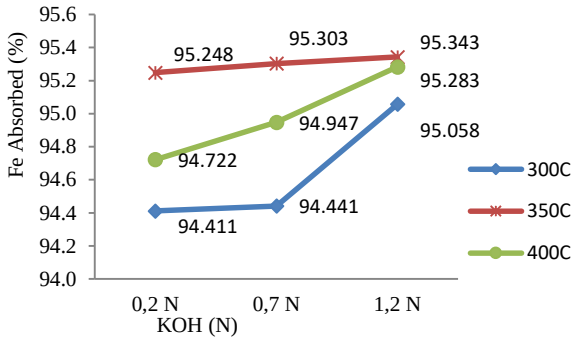

Figure2 The Effect of KOH Activator Concentration and Carbonization Temperature on Absorption of Fe Content.

Based on the absorption data, carbonization temperature at 350ºC and the highest KOH activator concentration at 1.2N was the optimum condition to absorb Fe by activated carbon with 95.34%. It is in line with research conducted by [13] which states that the greater the concentration of KOH, the greater the degradation of the material occurs so that the yield value will decrease.

However, the difference in the absorption of Fe, both variations in carbonization temperature and activator concentration, was not very significant. All samples had good absorption, which was greater than 90%. The contact time of each sample for 2 hours and stirring at 100 rpm for 1 hour was very influential to produce good adsorbent absorption.

From the results of the study, the concentration of Fe metal decreased along with the increase in the concentration of KOH activator. It was because the concentration of the activator was one of the factors that affected the absorption by the adsorbent. The higher of activator concentration, the activated carbon pores are open larger and affected to increase the activated carbon absorption capacity and increase the activated carbon surface area. The existence of KOH as an activating agent kept the sample from burning by reacting with the mineral content in the raw material so that no ash was formed and caused a grayish color [14].

The activation process was also resulting in the loss of carbon because it formed carbon dioxide gas. The chemical reactions occurred in the manufacture of activated carbon with KOH activator following equations 2), 3), and 4):

$$C + 6\,KOH \leftrightarrow 2\,H_2O + 4\,K + CO_2 \quad (2)$$

$$C + 6\,KOH \leftrightarrow 2\,K + 2\,K_2CO_3 + 3H_2 \quad (3)$$

$$2\,CO_2 + 4\,KOH \leftrightarrow 2\,H_2O + 2\,K_2CO_3 \quad (4)$$

The above reaction also released water because KOH is a dehydrating agent. In this activation process the carbon reacted with KOH so that the carbon was eroded (forming carbon dioxide) resulting in the formation of pores. The formation of these pores enlarged the activated carbon surface area obtained and the adsorption efficiency also increased [13].

The temperature effect in the activated carbon absorption is closely related to the formation of carbon pores [15]. When the carbonization is in process, CO2 gas is released and forms a certain size of pores that become an absorption surface area unit, where the larger absorption surface area affected the higher activated carbon absorption as a result.

In the carbonization process, the adsorption was still relatively low, but the surface area was exposed but. It is caused by tar residue that covers the pores. Tar will dissolve when soaked in chemical activation [16]. [17] Stating that in the activation process, chemical solution mixed with a chemical solution and oxidation will occur and it damages the interior of the carbon, as a result, the number of pores becomes larger. The activation process also results in the loss of carbon because it forms carbon dioxide gas

From the research conducted, the best activated carbon was found at the carbonization temperature of 350^0 C and the activation concentration of 1.2 N with the absorption of Fe, which is 95.343%.

4. CONCLUSION

Based on the results of the research conducted, it can be concluded that this study obtained activated carbon from Eucalyptus pellita bark regarding Indonesian National standards. The higher the carbonization temperature, the larger the activated carbon pores surface, and high temperatures caused the carbon to become brittle. So it needs a suitable temperature for the activated carbon from Eucalyptus pellita bark manufacturing, which was 350ºC. The higher of the KOH activator concentration affected to the better quality of the activated carbon. The optimum concentration of the activator was 1.2 N, for the absorbed Fe content was 95.355%.

AUTHORS' CONTRIBUTIONS

All autors in this publication have jointly carried out research activities and writing this article.

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