

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More](#)

OK

 Journals

[information and setup](#)
Books

Conferences

 [EDPS Account](#)



MATEC Web of Conferences

All issues

Series

Forthcoming

About

 Search

 Menu

[All issues](#) ▶ Volume 248 (2018)

[◀ Previous issue](#)

[Table of Contents](#)

[Next issue ▶](#)

Free Access to the whole issue

MATEC Web of Conferences

Volume 248 (2018)

4th Engineering Science and Technology International Conference (ESTIC 2018)

Padang, West Sumatra, Indonesia, August 28-29, 2018

A. Hazmi, R.A. Hadiguna, H. Suherman and R. Desmiarti (Eds.)

Export the citation of the selected articles [Export](#)

[Select all](#)

Open Access

Statement of Peer review

Published online: 10 December 2018

PDF (43.4 KB)

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More](#)

OK

About the conference

Published online: 10 December 2018 [information and setup](#)

PDF (740 KB)

- ∨ [Mechanical Engineering](#)
- ∨ [Electrical Engineering](#)
- ∨ [Industrial Engineering](#)
- ∨ [Chemical Engineering](#)
- ∨ [Science](#)

- *Mechanical Engineering*

Open Access

Effect of Thickness Reduction on Cold Rolling Process to Microstructure and Brass Hardness 01001

Agung Setyo Darmawan, Bambang Waluyo Febriantoko, Agus Dwi Anggono, Tri Widodo Besar Riyadi and Abdul Hamid

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801001>

PDF (1.832 MB) | [References](#)

Open Access

Air flow Simulation in correlation of the Outside Engine Temperature Change with Variation of the Grill 01002

Rahmat Riza, Paryana Puspaputra and Wajib Haryono

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801002>

PDF (1.924 MB) | [References](#)

Open Access

Performance Study on Solar Hybrid Air-Conditioning System for Residential Water Heating 01003

Kaidir, Mulyanef and Burmawi

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801003>

PDF (1.375 MB) | [References](#)

- Open Access By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#) OK
-
- Open Access **Performance Experimental Study of Solar Still With Reflector To Produce Fresh Water and Salt** 01004

Mulyanef, Duskiardi, Kamaruzzaman Sopian, Kaidir and Zulfika Rahman

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801004>

[PDF \(1.760 MB\)](#) | [References](#)

-
- Open Access **Characterization and Compressive Strength of Biocomposite Hydroxyapatite-Borosilicate with Hight Temperature Sintering** 01005

Burmawi, Novesar Jamarun, Syukri Arief and Gunawarman

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801005>

[PDF \(1.365 MB\)](#) | [References](#)

-
- Open Access **Peculiarities of Injection Molding Conducting Composites** 01006

Yovial Mahyoedin, Jaafar Sahari, Andanastuti Mukhtar, Norhamidi Mohammad and Iqbal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801006>

[PDF \(1.817 MB\)](#) | [References](#)

-
- Open Access **Effect of graphite sizes and carbon black content on flowability of the injection molded conductive composite material** 01007

Yovial Mahyoedin, Jaafar Sahari, Andanastuti Mukhtar, Norhamidi Mohammad and Suryadimal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801007>

[PDF \(1.856 MB\)](#) | [References](#)

-
- Open Access **Experimental Investigation of Vibration Response of a Flexible Coupler**

In a Four Bar Mechanism Due to Varying Crank Length and Crank

Speed 01008

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#)

OK

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801008>

[PDF \(1.808 MB\)](#) | [References](#)

Open Access

The in-plane electrical conductivity: the rotation parameters effect on producing graphite/epoxy composites 01009

Hendra Suherman, Andro Hamdani, Edi Septe, Yovial and Irmayani

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801009>

[PDF \(1.752 MB\)](#) | [References](#)

Open Access

Design and Production of Rotary Type Machine for Chop Up Organic Waste Plantation 01010

Wenny Marthiana, Duskiardi, Rizky Arman, Yovial Mahyoedin and Dedi Wardiyanto

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801010>

[PDF \(1.563 MB\)](#) | [References](#)

Open Access

Strain-Stress Formation and Deformation of Molded Materials by Drying-Induced Shrinkage 01011

Yoshinori Itaya

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801011>

[PDF \(2.324 MB\)](#) | [References](#)

Open Access

Extrusion Process of Polypropylene Composites Reinforced Milled Carbon Fibre for Conductive Polymer Composite Application 01012

Nabilah Afiqah Mohd Radzuan, Abu Bakar Sulong and Mahendra Rao Somalu

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824801012>

By using this website, you agree that EDP Sciences may store web audience

OK

PDF (1.614 MB) | [References](#)

measurement cookies and, on some pages, cookies from social networks. [More](#)

[information and setup](#)

- *Electrical Engineering*

Open Access

Development of a Web-Based Convergent Hospital Billing System 02001

Adhistya Erna Permanasari, Silmi Fauziati and Argi Kartika Candri

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802001>

PDF (1.991 MB) | [References](#)

Open Access

Smart Clothline System Based on Internet of Thing (IoT) 02002

Zakiah Mohd Yusoff, Zuraida Muhammad, Amar Faiz Zainal Abidin, KA Nur Dalila, Noor

Fadzilah Razali, Masmaria Abdul Majid and KK. Hasan

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802002>

PDF (1.655 MB) | [References](#)

Open Access

Grid Study of Mini Hydro Power Plant (MHPP) of Palangai Hulu 2x4,9
MW South Pesisir 02003

Hidayat, Cahayahati, Arnita and Saiful Jamaan

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802003>

PDF (1.561 MB) | [References](#)

Open Access

Study of Capacitor Bank Switching Transient in Distribution Network
02004

Indra Nisja, Mirza Zoni and Arnita

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802004>

PDF (1.687 MB) | [References](#)

Open Access By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#) OK

Online Position Control Performance Improving Applying Incremental Fuzzy Logic Controller 02005

Dirman Hanafi, Mohamed Najib Ribuan, Wan Hamidah Wan Abas, Hidayat, Elmy Johana, Herman Wahid, Rozaimi Ghazali and Hisyam Abdul Rahman

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802005>

PDF (2.154 MB) | [References](#)

Open Access

Analysis of Characteristics Over Current Relay and Ground Fault Relay on Feeder Rayon Tabing 02006

Arzul, Ija Darmana, Eriwati, Adiv Rama Salvayer and Tris Safri Yetno

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824802006>

PDF (1.719 MB) | [References](#)

- Industrial Engineering

Open Access

Gender Influence on the Household Electrical Energy Consumption Behavior 03001

Maria Isfus Senjawati, Lusi Susanti, Hilma Raimona Zadry and Prima Fithri

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803001>

PDF (1.600 MB) | [References](#)

Open Access

Intervention Selection to the Awareness of Energy-Saving Behavior in the Public Sector 03002

Rozza Linda, Lusi Susanti and Hilma Raimona Zadry

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803002>

PDF (1.545 MB) | [References](#)

Open Access

Designing Improvement of Procurement Business Process

By using this website, you agree that EDP Sciences may store web audience

Reengineering Approach : A Study Case of Insurance Company 03003

measurement cookies and, on some pages, cookies from social networks. [More](#)

Almira Rhea Masayu and M. Dachyar

[information and setup](#)

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803003>

PDF (1.378 MB) | [References](#)

Open Access

The Valuation of Geothermal Power Projects in Indonesia Using Real Options Valuation 03004

Reza A. Bilqist, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803004>

PDF (1.635 MB) | [References](#)

Open Access

Determining Criteria of Human Resource Information System that Affect Human Resource Performance in Companies Using DEMATEL-Based ANP Method 03005

Eveline Siregar and M. Dachyar

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803005>

PDF (1.764 MB) | [References](#)

Open Access

Analysis of Outpatient Service Queue of Public Hospital in Jakarta 03006

M. Dachyar, Farizal and M. Mansur Yafi

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803006>

PDF (2.009 MB) | [References](#)

Open Access

Improvement Priorities: Public Hospital Service Quality 03007

M. Dachyar, Farizal and Alicia Ti

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803007>

[PDF \(1.566 MB\)](#)[References](#)

By using this website, you agree that EDP Sciences may store web audience

OK

measurement cookies and, on some pages, cookies from social networks. [More](#)



Open Access

[information and setup](#)

Determining Criteria for Food SME's Supplier Selection Using DEMATEL-Based ANP Method 03008

Yasmin Ramadhani, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803008>[PDF \(1.733 MB\)](#)[References](#)

Open Access

Strategy Design to Improve the Implementation of Supply Chain Management in Food SMEs 03009

Agustina Windaryanti, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803009>[PDF \(1.439 MB\)](#)[References](#)

Open Access

Scheduling for Indonesia's Aircraft Wing Structure Design Project with Critical Path Method and Resource-Constrained Project Scheduling 03010

Melissa Putri Hidayat, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803010>[PDF \(1.742 MB\)](#)[References](#)

Open Access

Scheduling of Aircraft Design Project: A Comparison of Critical Path Method, Design Structure Matrix and Genetic Algorithm Approaches 03011

Ariani Amalia, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803011>[PDF \(1.518 MB\)](#)[References](#)

Open Access By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#) OK

Scheduling of Empennage Structure Design Project of Indonesia's

Aircraft with Critical Path Method (CPM) 03012

Arin Wulandari, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803012>

[PDF \(1.597 MB\)](#) | [References](#)

Open Access

Implementation of Risk Management in Manufacturing of Wellhead and Christmas Tree Equipment (Risk management framework) 03013

Abdul Hamid, Ishak Bin Baba, Sulaiman Bin Haji Hasan, Agung Setyo Darmawan and Nushatisah

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803013>

[PDF \(1.746 MB\)](#) | [References](#)

Open Access

Product Distribution Optimization in Food SMEs with Integer Linear Programming 03014

Syafira Chika Widiyanti, M. Dachyar and Farizal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803014>

[PDF \(1.600 MB\)](#) | [References](#)

Open Access

Patients' Loyalty Improvement in Public Hospital 03015

M. Dachyar, Farizal and Ika Prisila Minar

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824803015>

[PDF \(1.645 MB\)](#) | [References](#)

Open Access

Optimization of Production Planning Using Goal Programming Approach at Chocolate Factory 03016

Noviyarsi, Lestari Setiawati and Arhamna Arisya

By using this website, you agree that EDP Sciences may store web audience

OK

Published online: 10 December 2018

measurement cookies and, on some pages, cookies from social networks. [More](#)

DOI: <https://doi.org/10.1051/matecconf/201824803016>

[information and setup](#)

PDF (1.627 MB) | [References](#)

Open Access

Quality Improvement of Industrial Products Bungo Mayang to Customer Satisfaction with The Kano Model Approach 03017

Yesmizarti Muchtiar, Dessi Mufti and Vil Yosri

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824803017>

PDF (1.518 MB) | [References](#)

- *Chemical Engineering*

Open Access

Scale Up Production Indonesian Liquid Propolis From Raw Propolis and Wild Beehive Using Bubbling Vacuum Evaporator 04001

Muhamad Sahlan, Andhika Akhmariadi, Diah Kartika Pratami, Heri Hermansyah and Anondho Wijanarko

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824804001>

PDF (1.571 MB) | [References](#)

Open Access

Chitin and Chitosan from Green Shell (*Perna Viridis*): Utilization Fisheries Wastes from Traditional Market in Jakarta 04002

Flora Elvistia Firdaus, Indah Purnamasari and Pandu Gunatama

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824804002>

PDF (1.819 MB) | [References](#)

Open Access

The Effectiveness Biosorption of Durian (*Durio zibhetinus*) Rind Pectin on Handling Liquid Waste Containing Heavy Metal (Pb II) 04003

Flora Elvistia Firdaus, Amida Redella and Sintani Nursabila

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824804003>

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More](#)

OK

[information and setup](#)

Open Access

The Production of Bioethanol from Rimau Gerga Lebong (Rgl) Orange Waste as an Alternative Energy 04004

Vike Darliyasi, Kurnia Herlina Dewi and Budiyanto

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824804004>

PDF (1.569 MB) | [References](#)

- Science

Open Access

Non-Ionizing Radiation (NIR) Exposure Map Development Using GIS for Gong Badak, Terengganu, Malaysia 05001

S.N. Hazmin, A.R.S.N. Dianah, M.K.A. Kamarudin, R. Umar and H.N. Syafiqah

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824805001>

PDF (1.942 MB) | [References](#)

Open Access

The Benefit of Wind Distribution Analysis for Coastal Construction Design in East Java Province 05002

Surya Hermawan, Joko Purnomo and Daniel Tjandra

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824805002>

PDF (1.424 MB) | [References](#)

Open Access

E-census Implementation: A Case study in Naikoten II, Kupang, Indonesia 05003

Lily Puspa Dewi, Adi Wibowo and Ngakan M.A. Immanuel

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/matecconf/201824805003>

PDF (1.495 MB) | [References](#)

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#) OK

Understanding the Behavioral Intention to Use a University Web-Portal

05004

Ezra Aditia, I Nengah Tela, Nursyam Saleh, Desi Ilona and Zaitul

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805004>

[PDF \(1.612 MB\)](#) | [References](#)

Open Access

Identification of Implementation Program of Electricity Competency

05005

Ija Darmana, Nizwardi Jalinus, Ganefri and Sukardi

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805005>

[PDF \(1.412 MB\)](#) | [References](#)

Open Access

Antecedents of Intention to Use E-Learning 05006

Khairudin, Susi Herawati, Desi Ilona and Zaitul

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805006>

[PDF \(1.440 MB\)](#) | [References](#)

Open Access

Application of Compound Bonding Based On Augmented Reality 05007

Alexander Setiawan, Silvia Rostianingsih and Timotitus Reinaldo Widodo

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805007>

[PDF \(1.730 MB\)](#) | [References](#)

Open Access

A Novel of Internal Corrosion Assessment Methods on Drinking Water Distribution Pipelines 05008

Edi Septe, Nizwardi Jalinus and Refdinal

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805008>

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More](#)

OK

[information and setup](#)

Open Access

Determinants of web-user satisfaction: using technology acceptance model 05009

Zaitul, Fanny Ramadhani and Desi Ilona

Published online: 10 December 2018

DOI: <https://doi.org/10.1051/mateconf/201824805009>

PDF (1.565 MB) | [References](#)

MATEC Web of Conferences

eISSN: 2261-236X



[Mentions légales](#)

[Contacts](#)

[Privacy policy](#)

A Vision4Press website

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More](#)

OK

[edp sciences](#) Journals[information and setup](#)
Books Conferences EDPS Account**MATEC** Web of Conferences

All issues
Series
Forthcoming
About

 Search  Menu

About the journal [▶ Editorial board](#)

About the journal

[Aims and scope](#)[Editorial board](#)[Indexed in](#)[Publishing Policies & Ethics](#)[Published by](#)

Editorial board

Rachid Bennacer

École Normale Supérieure, Cachan, France

[website](#)

Chérifa Boukacem-Zeghmouri

Université Claude Bernard Lyon 1, Villeurbanne, France

[website](#)

Vladimir Buzek

Slovak Academy of Sciences, Bratislava, Slovakia

[website](#)

Heidi Gautschi

Haute Ecole Pédagogique de Lausanne, Switzerland

By using this website, you agree that EDP Sciences may store web audience

OK

Éric Lichtfouse

measurement cookies and, on some pages, cookies from social networks. [More](#)

National Research Institute for Agriculture, Food and Environment (INRAE), Aix-en-
[information and setup](#)

Provence, France

[website](#)

Paulo Limão-Vieira

Universidade NOVA de Lisboa, Portugal

[website](#)

Maria S. Madjarska

Max Planck Institute for Solar System Research, Germany

Thierry Maré

Ambassade de France en Indonésie, Jakarta

Université de Rennes 1 /IUT Saint Malo, France

[website](#)

Nigel Mason

University of Kent, Canterbury, United Kingdom

Biswajeet Pradhan

University of Technology Sydney, Australia

[website](#)

Jun Sun

Tianjin University of Science and Technology, P.R. China

[website](#)

Ming-Jun Zhang

DGUT-CNAM Institute, Dongguan University of Technology, Guangdong Province, P.R.

China

[website](#)

Zhien Zhang

The Ohio State University, Columbus, USA

By using this website, you agree that EDP Sciences may store web audience measurement cookies and, on some pages, cookies from social networks. [More information and setup](#)

MATEC Web of Conferences

eISSN: 2261-236X

OK



[Mentions légales](#)

[Contacts](#)

[Privacy policy](#)

A Vision4Press website

REVIEW FORM

(This is an MS Word form to be filled out electronically, saved and emailed to the committee)

Dear Reviewer,

Please notice that reviewing needs to be conducted confidentially. The paper you have been asked to review should not be disclosed to a third party. Be aware when you submit your review that any recommendations you make will contribute to the final decision made by the editor in chief. Please return the review within **one week**. Please send the completed form to estic2018@bunghatta.ac.id. We thank you for your cooperation!

ITEMS	Column to be filled in by Reviewer
Name of reviewer	-
Date review completed(dd/mm/yyyy)	01/07/2018
Signature of reviewer(<i>digital or initials</i>)	-
Paper ID	ESTIC-024
Paper Titles	The Effectiveness Biosorption of Durian (Duriozibhetinus) Rind Pectin on Handling Liquid Waste Containing Heavy Metal (Pb II)
(A) Abstract evaluation - Please rate the following:	Please choose only one number from 1 to 5 for each row below (5 excellent, 1 poor)
1. Background, purpose, methods, and results clearly summarized in abstract	4
2. Abstract well organized, coherent, and clearly written	4
3. Abstract is free from grammatical and spelling errors	4
4. Appropriateness of abstract as a description of the paper	4
Suggestions for improvement of Abstract Please write your comments in the space below.	
Please add a problem statement	

(B) Overall paper - Please rate the following:	Please choose only one number from 1 to 5 for each row below (5 excellent, 1 poor)
1. Relevance to the conference	5
2. Title clear and adequate	4
3. Originality, novelty and significance of results	4
4. Appropriateness of the research/study method	4
5. Comprehensibility & presentation of the paper	4
6. Standard of language	3
7. Discussion and conclusions	4
8. Relevance and clarity of drawings, graphs and tables	4
9. Reference list, adequate and correctly cited	4
10. Overall paper rating of the paper	4
(C) Recommendations:	Please choose only one of the 4 options below (put an "X" for your selection)
1. Accept, no revision needed	
2. Accept, but needs minor revision	X
3. Accept, but needs major revision	
4. Reject, poor quality/out of scope	
(D) Specific reviewer comments to be sent to the author/s	
(Please expand on any weak areas in the checklist (B) and offer specific advice as to how the author/s may improve the paper.) Please write your comments below.	
<p>The title should be:</p> <p>...</p> <p>Material and Method</p> <p>-</p> <p>-</p> <p>-</p>	

Just make it in narrative form.

-
-

Results and discussion

-
-

Conclusions

-
-

(E) Confidential comments to Program Committee

Optional (If there is any comments to the Program Committee only, please write your comments below)

The Effectiveness Biosorption of Durian (*Durio zibhetinus*) Rind Pectin on Handling Liquid Waste Containing Heavy Metal (Pb II)

Flora Elvistia Firdaus ^{1,*}, Amida Redella ², Sintani Nursabila³

^{1,2,3} Chemical.Eng, Jayabaya University, Jl Pulomas Selatan Kav 23 Jakarta 13210 Indonesia

Abstract. Heavy metal is one of the most substances occur in water pollutants. It is harmful to humans and other living things. The biosorption of pectin from durian rind is used as a heavy metal binder. However, the type of pectin presented in organic waste is generally HMP (High Methoxyl Pectin), which previously should be demethylation. Durian rind used in this study are originated from Bogor West Java. This study aims to determine the effectiveness of pectin biosorbent in reducing the concentration of heavy metal (Pb II). Pectin extraction was carried out at 80 °C within a time variation of 1; 5; and 6 hours. The results showed that the most optimum pectin is with 6 hours of extraction time where the methoxyl content is 3.46%; weight equivalent 3860 % galacturonate content; the degree of esterification 20.29%; and lead (Pb II) uptake 97%. While durian seeds do not contain pectin.

1 Introduction

The mining industry in Indonesia like any other country produces heavy metals which sufficiently to the fulfillment of infra structure. The worrying consequences are led to metal contamination on surface water if managed inappropriately. The health problems and other environmental degradation can be impacted to the quality of life. Efforts of handling heavy metal pollution can actually be done by using chemical processes which expensive and tends to cause new problems [1], the process produces high toxic [2]. Another alternative is using biological materials namely biosorption, with low cost, high efficiency, minimization of mud formation, and ease of regeneration process [3]. Pectin is an ionic plant cell [4] can be used as biosorbent [5]. The active group present in pectin will bind metals [6-7] and forms complex compounds [8].

Pectin is a polymer of 1-4 linked D-galacturonic acid where widely used in industries [9], can be used as biosorbent because of many active groups which are generally High Methoxyl Pectin (HMP) type. It must be demethylated to LMP to be applied to heavy metals. Citrus pectin absorbs metal Pb (II) to almost 90% in the amount of pectin 0.1 g/L and Pb concentration of 0.1 mm [10]. The purpose of this study is to determine the effectiveness of pectin biosorbent in reducing the concentration of heavy metal (Pb II).

* Corresponding author: flora_elvistia@yahoo.com

2 Experimental

2.1 Sample Preparation

The durian rind and seed are collected from local fruit stall in Bogor origin, West Java, Indonesia. The rind was washed and dried with oven for 3 hours. The fine durian rind and seed samples were added aquadest with the ratio 1:10 (gr/mL) and HCL 2 N until it reached pH 2. The samples were heated in an oven at 80 °C for 1; 5; and 6 hours. Strain and wash with 96% ethanol solution. Put in the oven with temperature 40°C until the sample is dry.

Pectin is dissolved in aquadest until it reaches a concentration of 1.5%. Add 3N NaOH solution to show pH 10. Then incubated with 55 °C for 1 hour. Cooled, then add HCL 3N solution to reach pH 3 and allowed to stay overnight. It was precipitated with 96% ethanol. Filter the pectin residue and washed with acetone. Dried in the oven. Blend until smooth and sifted with Mesh 60.

2.2 Qualitative Identification

The pectin yield is the amount of pectin in grams resulting from durian rind and its seed extraction, at various treatment times of extraction (1, 5, and 6 hours).

$$\text{Yield} = \frac{\text{Pectin (mgr)}}{\text{Weight of dry sample (gram)}}$$

The equivalent weight was determined to 0.5 grams of pectin samples which inserted into 250 mL Erlenmeyer, add 2 mL of 96% ethanol, dissolve it with 1 gr of NaCl solution in 100 mL aquadest, then add 6 drops of Phenolphthalein indicator. Perform titration with a standard 0.1 N NaOH, and calculates the equivalent weight using the formula:

$$\text{Equivalent Weight} = \frac{\text{Pectin (mgr)}}{V_{\text{NaOH}} \times N_{\text{NaOH}}} \quad (1)$$

The neutral solution of the equivalent weight determination plus 25 ml of 0.2 N NaOH solution. Then added 25 mL of 0.2 N HCl solution and 5 dropped of phenolphthalein, titrated with 0.1 N NaOH solution until it turns pink.

$$\text{Methoxyl Content (\%)} = \frac{\text{mL NaOH} \times N_{\text{NaOH}} \times 31}{\text{Pectin (mgram)}} \times 100 \quad (2)$$

The Galacturonate levels are calculated from the milliequivalent (mEq) of NaOH obtained from the determination of equivalent weight and methoxyl content. The value 176 is obtained from the lowest equivalent weight of pectic acid. The calculation using the formula:

$$\text{Galacturonate Content (\%)} = \frac{(\text{mEq Wt} + \text{mEq methoxyl}) \times 176}{\text{Pectin (mgram)}} \times 100 \quad (3)$$

The degree of esterification is calculated from the methoxyl and galacturonate acid levels obtained.

$$\text{Degree of Esterification (\%)} = \frac{176 \times \% \text{ methoxyl}}{31 \times \text{galacturonate}} \times 100 \quad (4)$$

2.3 Capacity the capacity Lead (Pb II).

Pectin samples from various treatments of 1 g were fed into a measuring flask each contain of 50 mL $\text{Pb}(\text{NO}_3)_2$ 10 mmol /L solution. The solution was centrifuged at 3000 rpm for 5 min. The supernatant was taken and the concentration of lead (Pb II) measured by Atomic Absorption Spectrum (AAS) at 283.3 nm wavelength [5].

3 Results and Discussion

3.1 Qualitative Identification of Durian Rind Pectin and Durian Seed.

The pectin of modified durian rind by treatment of different extraction times has yielded a positive response. The durian seed does not form anything during the qualitative test, it can be concluded it does not contain pectin. The hypothesis to this result, durian seed pectin powder is only a sap of durian seed and is not a pectin so no further research on durian seed pectin.

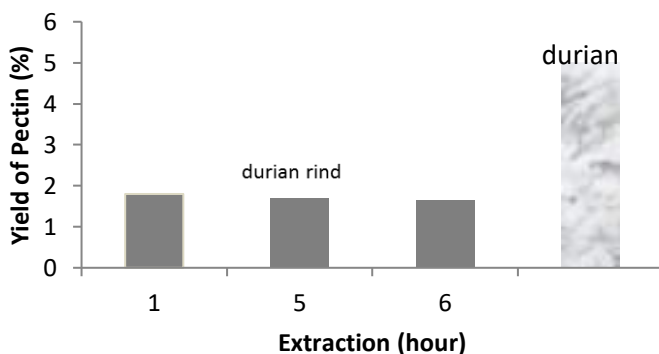


Fig 1. The Yield of Pectin in an average of Modified Durian rind and Durian Seed

The pectin yield is the amount of modified pectin in grams resulting from rind extraction at various times of extraction; 1; 5; and 6 hours and the durian seed the result then compared to dry powder. The yield of modified durian rind pectin with an hour extraction time shows the value of 1.80%; the yield of 5 hour extraction time has shown the value of 1.59%, and the yield of 6-hour of extraction is 1.49%. In the modified durian rind pectin the yield value decreases as the time of extraction take longer. The durian seeds show the value of 5%, this could be other substances than pectin that took part in the solid as seen in Fig 1.

The equivalent weight is the content of free un-esterified galacturonate acid consist of methyl ester group which are not esterified. The lower the pectin level causes the lower equivalent weight [11]. The highest equivalent weight in average is 5022 gr/eq within 1 hour of extraction. The equivalent weight of 5 hours and 6 hours of extraction of durian rind are respectively 4179 gr/eq and 3860 gr/eq. This means a modified durian rind pectin within 6 hour extraction time has the most pectin compared to extracted for 1 or 5 hours.

3.2 Methoxyl content

Pectin is comprised into two groups, namely low methoxyl pectin (LMP) and high methoxyl pectin (HMP) [12]. The lowest methoxyl content was in modified pectin with an hour extraction of 3.09%. While the highest is achieved in 6 hours of extraction time, is 3.46%. It can be concluded that modified pectin produced pectin with low methoxyl content as illustrated in fig 2. Galacturonate content produced in this study was 84.11% for 1-hour

extraction, 91.25% for 5 hours extraction, and 96.78% for 6 hours extraction. The minimum permissible galacturonate level according to International Pectin Producers' Association

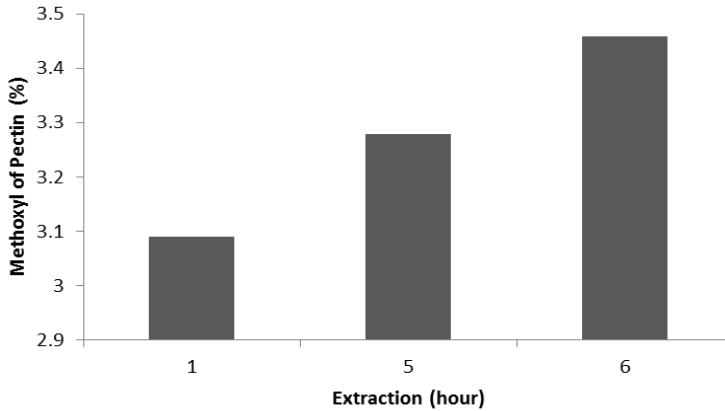


Fig 2. The Methoxyl content in an average of Modified Durian Rind Pectin

(IPPA) is 65%, so the resulting pectin has met the requirements of pectin quality. The lower the methoxyl pectin level, the low gel forming [13]. The degree of esterification of modified durian skin pectin for 1 hour is 20.83%, in 5 hours of extraction is 20.38%, the lowest is 6 hours of extraction time is 20.29%. These are classified as low methoxyl pectin (LMP).

3.3 The capacity for Pb (II) Uptake

Pectin modification causes esterification to decrease, so increase the activity of the adsorption because of the lower the degree of pectin esterification the more active pectin

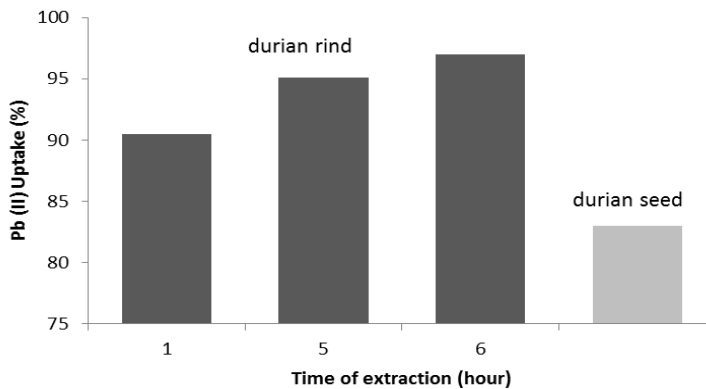


Fig 3. The Pb (II) uptake Capacity of Modified Pectin rind

group [5]. In durian rind pectin, for the time of extraction 1; 5; and 6 hours are respectively 90.46%; 95.1%; and 97%. The highest value is with 6 hours of extraction. So it is concluded that the longer the extraction time, the higher the absorption of Pb (II). Durian seeds do not show any response to various qualitative tests conducted, it is concluded that durian seeds do not contain pectin. Its absorbency shows a high enough value which is 83% as illustrated in Fig 3.

4 Conclusions

Durian waste can be used as raw material for making pectin. Modified durian skin pectin has a brownish yellow color. Optimum condition of pectin extraction results when viewed from the characteristics and absorption of lead metal was with 6 hours of extraction time. With a yield of 1.49%; weight of equivalent 3860.7 gr/eq; 3.46% methoxyl content; levels of 96.78% galacturonate acid; degree of esterification 20.29%; and 97 % of lead (II) uptake. While durian seed, throughout various of qualitative tests, was conducted does not give any responses, so it is concluded durian seeds do not contain pectin.

The author gratefully acknowledges the support of the Indonesia Ministry of Research and Technology, Department of Higher Education as funding the research.

References

1. B.Volesky., Z.R Holan, *Biotech. Prog.* **11**, 235 (1995)
2. AG, Prasad, and M.A.,Abdullah, *J of Appl Sci in Env Sanitation*, **4**, 273 (2009)
3. SE,Bailey, Olin, TJ, Bricka, and Adrian, *Water Research*, **33**, 2469 (1999)
4. CMGC, Renard, MJ, *Crépeau*, JF, Thibault, *Carb. Research* **275**, 155 (1995)
5. WW, Abbas, FMA, Liong, ME, Azhar., *Internat Food Research J.*, **15**, 363 (2008)
6. Kartel, Kupchik, Veisof, *Chemosphere* **38**, 2591 (1999)
7. N, Ahalya, TV, Ramachandra and RD, Kanamadi, *Research J. of Chem. and Env.*, **7**,72 (2003)
8. LA, Kupchik, NT, Kartel, ES, Bogdanov, OV, Bogdanova and MP, Kupchik, *Russian J. of appl. chem*, **79**, 457 (2005).
8. M, Rodriguez, M, Zalba, and A, Debbault, *J.Colloid Polym*, **285**, 119 (2006)
9. A, Balaria, Ankit, and S,Schiewer, *Separation and Purification Tech.*, **63**, 579 (2008)
10. APC, Saratha Devi & VM, Devi, *Internat. J. of Eng. Research & Tech.*,**3**, 1925 (2014)
11. BM, Yapo and KL, Koffi, *Foods*, **3**: 1, (2014)
12. BR, Sharma, L, Naresh, and NC, Dhuldhoya, *Times Food Processing Journal*, **23**, 44 (2006)



AUGUST 28-29, 2018
THE AXANA HOTEL
PADANG, INDONESIA

Certificate

THIS CERTIFICATE IS AWARDED TO

Flora Elvistia Firdaus

as Presenter in the

4th Engineering Science and Technology International Conference
(ESTIC 2018)

Organized by The Faculty of Industrial Technology of Bung Hatta University

the 4th ESTIC 2018 *Signature*

Dr. Yovial Mahyoedin
Chairman