

BADAN PENERBIT DAN PUBLIKASI UNIVERSITAS GADJAH MADA



THE 3rd INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY

11–12 July 2017 / Yogyakarta, Indonesia

5 th	Asian Network for Natural and Unnatural Material
2 nd	Computer Symposium
2 nd	Geomaritime Symposium
1 st	OMICS Symposium: from Genomics to Metabolomics
1 st	Infrastructure Technology Symposium

Welcoming Remarks from The 3rd ICST Chairman

Assalaamu'alaikum warahmatullaahi wabarakaatuh

On behalf of the Organizing Committee, I would like to welcome all of you distinguished guests, invited speakers, and participants—of the 3rd International Conference on Science and Technology. This conference is held as part of the Universitas Gadjah Mada Annual Scientific Conference (UASC) which consists of 4 major events: International Conference on Science and Technology (ICST), International Conference on Tropical Agriculture (ICTA), International Conference on Health Sciences (ICHS), and International Conference on South East Asia Studies (ICSEAS).

The 3rd International Conference on Science and Technology itself consists of 5 symposia, namely the 5th Annual Network on Natural and Unnatural Material Symposium (ANNUM 5), 2nd Computer Symposium, 2nd Geomaritime Symposium, 1st OMICS Symposium, and 1st Infrastructure Technology Symposium. The accepted papers of the conference will be published in journals that are indexed by Scopus or DOAJ/EBSCO: the Indonesian Journal of Chemistry, Indonesian Journal of Geography, Indonesian Journal of Biotechnology, or IEEE Xplore digital library. In addition, the Organizing Committee also provides ICST Proceeding for the publication of conference papers which cannot be published in those journals or publication media due to certain reasons.

Around 288 people are attending this conference. They consist of 221 presenting participants, 29 non-presenting participants, and 38 invited speakers. From this number, 154 people (53%) are joining the ANNUM Symposium, 36 participants (12%) are attending the Computer Symposium, 31 people (11%) are the participants of the Geomaritime Symposium, 19 participants (7%) are for the OMICS Sympoium, also 19 participants (7%) are joining Infrastructure Technology Symposium, and 29 people (10%) are non-presenting participants. In fact, these 221 participants attending this conference are only 47,8% of the total 462 people who submitted their abstracts to this ICST 2017. Due to the obligation for submitting full papers and the tough review process of the papers, around 52,2% people finally decided to not continue their participation in this conference.

In terms of country of origin, the participants of this ICST 2017 are coming from 12 countries i.e. Indonesia, Malaysia, Australia, Japan, Korea, India, Philippines, Singapore, Rusia, France, United Kingdom, and South Africa. In this case, Indonesia, Malaysia, and India are three countries with the greatest number of participants of this conference.

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THE 3rd INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY // WELCOMING REMARKS

The ICST 2017 should be beneficial for all participants. They will learn many new aspects of research in the related topics, either from the invited speakers or general participants. In addition, they could also interact each other which leads to a strong and broad networking in the future.

This 3rd ICST could not become a reality without the help and assistance of many parties. Thus, in this occasion I would like to sincerely thank the Rector of Universitas Gadjah Mada, BPP officers and staff, invited speakers, ANNUM officers, Department of Chemistry FMIPA UGM, Department of Computer Science and Electronic & Instrumentation FMIPA UGM, Department of Electrical Engineering and Information Technology, Faculty of Engineering UGM, Department of Civil and Environmental Engineering, Faculty of Engineering UGM, Faculty of Biology UGM, Faculty of Geography, UGM, all members of the Organizing Committee, Eastparc Hotel, and all sponsors, who have provided meaningful help and assistance for the implementation of this conference.

So far, we have tried to do our best to prepare the ICST 2017. Nonetheless, there is nothing completely perfect in the world including this conference. Therefore, please accept our deep apologies for any inconvenience found in this conference.

Last but not least, please enjoy the International Conference on Science and Technology and your stay in Yogyakarta. Wassalamu'alaikum warahmatullaahi wabarakaatuh

Yogyakarta, 11 July 2017 Chairman of the Organizing Committee,

Prof. Dr. Jumina

Welcoming Remarks from The Rector of Universitas Gadjah Mada

Dear distinguished invited speakers, participants, ladies and gentlemen,

On behalf of Universitas Gadjah Mada, it is my pleasure and privilege to welcome you to Yogyakarta for the 3rd International Conference on Science and Technology (ICST 2017), hosted by Universitas Gadjah Mada (UGM). This conference brings together academics and professionals across the whole spectrum of science and technology in a time of exciting technological advancement. Society has never moved faster, placing ever greater demands on science and industry, which to date have kept pace through innovation, research, and the sharing of ideas on occasions such as this. Bridging the gap between disciplines has never been more important, and UGM is proud to be leading the way in facilitating the interdisciplinary dissemination of cutting-edge information between subjects as diverse as chemistry, computer science, omics, geomaritime, and infrastructure technology.

Over its 67 year history, UGM has earned a reputation as a pioneering university, pushing the boundaries of discovery and serving as a valuable source of knowledge. Our university has consistently striven to be at the forefront of scientific progress.

With its Annual Scientific Conference Series, Universitas Gadjah Mada builds upon this mission, holding annual gatherings for the brightest minds from Indonesia and abroad to share the latest findings in their respective fields. Through collaboration with our international partners, this series has seen enormous success, shaping the development of scientific networks, increasing Indonesian authors' prominence in publications with a global readership, and underscoring UGM's place as a standard-bearer of scientific development.

We are honored and humbled at the number of people who will be in attendance at this year's conference. The response from authors and participants to the ICST 2017 has truly been remarkable. I don't think I am being too forward in saying that the lively debates borne from today and tomorrow's events will likely impact the fields of science and technology for many years to come.

We thank the invited speakers for the expertise and knowledge they will bring to the conference, and of course the inevitable discussion their talks will spur. Special thanks is also extended to the members of the organizing committee for their hard work in bringing this conference together, as well as the entire staff of UGM's Badan Penerbit dan Publikasi (BPP) for making the ICST 2017 a reality. And last but not least, we would like to thank all of the conference participants who will contribute to making this the most memorable ICST yet.



THE 3rd INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY // WELCOMING REMARKS Over the next two days, we will have the opportunity to gain precious insight into the future of science and technology. I wish you all a wonderful stay in Yogyakarta, and above all a successful ICST 2017.

Thank you.

Prof. Ir. Panut Mulyono, M. Eng., D.Eng.

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Isolation and Characterization of Cellulose from Palm Midrib

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ABSTRACT

The purpose of this study was to know the effect of the NaOH concentration on ash content, water holding capacity (WHC), and oil holding capacity (OHC) of cellulose flour isolated from palm midrib. Cellulose isolation was done using a solution of NaOH with various concentrations namely 9, 12, 15, 18%. Cellulose flour obtained were analyzed ash content, WHC, and OHC. Cellulose flour isolated with NaOH 15% had ash content 2.12% (d.b), WHC 5.4 (g/g), and OHC 2.99 (g/g).

Keywords: isolation, characterization, cellulose, palm midrib

INTRODUCTION

Indonesia is the largest exporter of palm oil and its derivatives after Malaysia which was almost 32.64% of global export [Sebayang and Sembiring, 2017]. The most popular part to be processed from oil palm was mesocarp part. The mesocarp section produced crude palm oil which was processed into raw material of cooking oil and various types of derivatives. Palm midrib is an underutilized part of the palm oil processing industry. Utilization of palm midrib should be done so that the economic value increases. Cellulose on palm midrib can be further processed into products with higher economic value and useful in applications. To obtain pure cellulose, it is necessary to isolate and characterize the process first. Palm midrib cellulose can be isolated by extraction process using NaOH solution. The purpose of this research was to know the effect of the NaOH concentration on ash content, WHC, and OHC of cellulose flour isolated from palm midrib

EXPERIMENTAL SECTION

Materials

This study uses palm midrib derived from oil palm plantation in Malang, East Java, Indonesia. The cellulose isolation process materials were NaOH (technical grade), aquades, NaCl, acetic acid, NaOCl (chlorine), and Na-metabisulfite. For cellulose characterization used palm oil and aquadest. The equipment used for the preparation of palm midrib flour include grinding machine and sieve. For the process of isolation of palm midrib cellulose used erlenmeyer 1 L, waterbath equipped temperature control, and dryer cabinet. The

sentrifuge equipment, desiccators, porcelein cups, furnaces (Heracus Instruments M-110) were used for characterization.

Procedure

Oil Palm Midrib flouring

Flouring palm midrib started with cutting and drying of palm midrib. After dried, the pieces of dried palm midrib milled by used a grinding machine and then sieved to 60 mesh size.

Cellulose Isolation of Palm Midrib

Cellulose isolation of palm midrib be done by the palm midrib flour isolated with NaOH solution with various concentrations (9, 12, 15, 18%) temperature of 100°C for 3 hours that aims to dissolve the non-cellulosic components. The solids were lagged after washing with clean water from residual of NaOH, immersion with distilled water mixed with NaCl and acetic acid. Be washed again and solids lagged were bleached with NaOCl and Na metabisulphite, then washed with clean water until the pulp (cellulose) obtained odorless hypochlorite. Cellulose were then dried using an oven.

Characterization of Palm Midrib Cellulose

The variables analyzed on palm midrib cellulose were ash content, WHC, and OHC. Methods used for analysis were WHC and OHC analysis [Valencia *et al.*, 2007].

Statistical Analysis

The data obtained were analyzed by Variant Analysis (ANOVA) followed by real difference test DMRT (Duncan Multiple Range Test) with confidence interval 5%.

RESULTS AND DISCUSSION

Effect of NaOH Concentration on Ash Content of Cellulose

Increased concentration of NaOH causes ash content decreases. This was because NaOH can dissolve minerals in the form of salt and other forms. The presence of high concentration OH-ions will easily bind to other metals, whereas the Na + ion will replace the salt group that binds to the acid group to dissolve the other salts [Hutomo *et al.*, 2012]. The effect of NaOH concentration on ash content of cellulose can be seen in Figure 1.



Figure 1. Effect of NaOH Concentration on Ash Content of Cellulose

Effect of NaOH Concentration on Water Holding Capacity of Cellulose

The varying concentrations of NaOH also affect the WHC of cellulose, the higher NaOH causing the WHC to decrease. The increase in NaOH concentration during the extracted process causes the degradation of cellulose molecules so that their molecular weight decreases [Varshney, 2006]. This will result in the ability to bind and free water molecules capture by complex polymers to be relatively lower. NaOH causes hydrogen bonds to weaken or break up so that the -OH available for interaction with water was also less. This was why the WHC tends to decrease with increasing NaOH concentration. The effect of NaOH concentration on cellulose WHC can be seen in Figure 2.



Figure 2. Effect of NaOH Concentration on Water Holding Capacity of Cellulose

Effect of NaOH Concentration on Oil Holding Capacity of Cellulose

Increasing the concentration of NaOH not only causes a decrease in WHC value, but on the other hand it can also causes a decrease in OHC value. Lignin physically wraps the cellulose in a hydrophobic matrix and is covalently bonded with hemicellulose. In the process of cellulose isolation there extraction stage using a solution of NaOH with various concentrations at a temperature of 100°C. During the extraction, NaOH was able to dissolve the lignin which resulted in decreased hydrophobicity. The decrease in hydrophobicity causes the ability of oil binding to decrease, which means that the OHC value will decrease as well. The effect of NaOH concentration on cellulose OHC value was shown in Figure 3.



Figure 3. Effect of NaOH Concentration on Oil Holding Capacity of Cellulose

Conclusion

The concentration of NaOH influence on some characteristics of cellulose flour isolated from palm midrib such as ash content, WHC, and OHC. Cellulose flour isolated with NaOH 15% had ash content 2.12% (d.b), WHC 5.4 (g/g), and OHC 2.99 (g/g).

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