FOREWORD

Assalamu’alaikum warahmatullahi wabarakaatuh and greetings.

This proceeding contains selected papers of 1st International Conference on Chemistry, Pharmacy, and Medical Sciences (ICCPM) which held on November 26-27, 2018, Santika Hotel, Bengkulu-Indonesia. The conference which was organized by the Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu.

The ICCPM 2018 is attended by more than 100 participants. In terms of origin, the participants of this ICCPM are coming from 6 countries i.e. Indonesia, Japan, US, Malaysia, Thailand, and India. The conference is the first international conference organized by the Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu and is expected to be held continuously every three years.

The conference particularly encouraged the interaction of research students and developing academics with the more established academic community in an informal setting to present and to discuss new and current work. Their contributions helped to make the conference as outstanding. The papers contributed the most recent scientific knowledge known in the field of Organic Chemistry, Material Chemistry, Pharmacy, Agricultural Chemistry, and Miscellaneous topic related to chemistry.

Our deep gratitude is strongly forwarded to all individuals who took part in the conference, especially the keynote speakers, invited speakers, all the presenters and participants as well as all students and staffs who have been involved in the preparation and execution of the conference and the publication of the proceedings. Our deep gratitude also forwarded for all reviewers the manuscript for this proceedings.

These Proceedings will furnish the scientists with a good reference book. I trust also that this will be an impetus to stimulate further study and research in all these areas.

Bengkulu, 30 November 2018
General Chair of ICCPM
Prof. Dr. Morina Adfa, M.Si
Committee

1st International Conference on Chemistry, Pharmacy and Medical Sciences (ICCPM, Theme: Advanced Research Development Base on Local Resources)

Santika Hotel, 27-28 November 2018

Organized by Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Bengkulu

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1. Prof. Dr. Mamoru Koketsu (Gifu University, JAPAN)
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3. Assoc. Prof. Dr. Agung Nugroho (Lambung Mangkurat University, INDONESIA)
4. Assoc. Prof. Dr. Sirikantjana Thongmee (Kasetsart University, THAILAND)
5. Assoc. Prof. Dr. Mohammad Abrar Alam (United State of America, USA)

Invited Speaker
1. Assoc. Prof. Dr. Mohamad Rafi (Bogor Agricultural University, INDONESIA)
2. Assoc. Prof. Dr. Noor Haida Mohd Kaus (Universiti Sains Malaysia (USM), MALAYSIA)
3. Assoc. Prof. Dr. Akhmad Sabarudin, D.Sc. (Brawijaya University, INDONESIA)
4. Assoc. Prof. Dr. Oman Zuas (Research Center for Metrology - LIPI, INDONESIA)
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The Effect of Liquid Rubber Compound Concentration to Mechanic Properties of Particle Board

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Abstract. Particle board research made from cocodust with various concentrations of liquid rubber compound has been done. First particle board was made by mixing cocodust powder with various concentration of liquid rubber compound there are 10; 20; 30; 40 and 50% to obtain a particle board with the length, width and height of 5 x 10 x 7.5 cm and then dried using an oven at 60 degrees for approximately 48 hours. Subsequently the particle board pressed to a thickness of 2.5 cm and then tested the modulus of elasticity (MOE), the modulus of rupture (MOR) and firmness of screws. The results indicated that the best condition was obtained on the use of 30% liquid rubber compound. In this condition, the MOR, MOE and the strength of screw are 182.27 g/mm², 618.18 g/mm² and 16910 g/mm² respectively. DTA-TG testing results show that the heat resistance of particle board is 240 °C.

Keywords: Particle board, cocodust, modulus of rupture, firmness of screws.

A. Introduction

The particle board is a board made of wood particles or other lignocellulose materials bonded with an adhesive and then heat-treated [1]. The advantages of this particle board is the size and density can be tailored to the needs in addition to the quality can be set. In addition, the particles used can be obtained from materials that are generally waste that has been no longer used [2, 3].

One of the lignocellulose materials that can be used to make particle board is cocodust which is a fine powder of coconut husk that has been separated from the fibers [4-7]. Cocodust is widely available throughout Indonesia, which is the world's major coconut producer and is a largely untapped waste material. As the adhesive for the particle board manufacture in this research will use of natural polymer in the form of liquid rubber compound which is a mixture of concentrated latex with certain chemicals to improve its properties [8]. As a raw material of liquid rubber compound is concentrated natural rubber latex which is also very much available in Indonesia considering Indonesia is the second of natural rubber producer in the world, so the sustainability of the production of particle board derived from liquid rubber compound and cocodust for the long term will not experience raw material constraints.

The existing problem is research on particle board making by utilizing particle from cocodust and adhesive from liquid rubber compound so far has not been done, because cocodust is only seen as the waste material from the rest of the coconut coir process. So the research of production and characterization of nature composite polymer of cocodust and liquid rubber compound as alternative of particle boards become very interesting to do.

The purpose of this research was to study the effect of liquid rubber compound concentration on mechanic properties of particle board. Determination of change on mechanical properties of particle board was done by determination the change value of the modulus of elasticity (MOE), the modulus of rupture (MOR), the screw hold strength and thermal test (DTA-TG).

B. Result and Discussion

2.1. Pieces of Particle Board Test

To perform particle board testing, we first made a piece of particle board test with size 5 x 10 x 7.5 cm with variation concentration of liquid rubber compound, then pressed after first dried using an oven at 60 degrees for...
approximately 48 hours, then test pieces of particle board ready for testing. The model of particle board test before and after pressing is as shown in Figure 1 below.

2.2. Modulus of Rupture (MOR) Test Result

The modulus of rupture (MOR) test results of particle board at various concentrations of the liquid rubber compound are as shown in Figure 2.

From the picture above shows that the value of the modulus of rupture (MOR) of the particle board increase on the greater concentration of liquid rubber compound, reaching maximum at the use of concentration of 30%, then decreased on the use of greater concentration. This indicates that the particle board made has the highest strength when 30% of the liquid rubber rubber compound is used. This is because in this condition the reaction that occurs between polyisoprene in liquid rubber compound with cellulose from cocodust is optimum so that the polymer formed becomes the strongest. At lower concentrations, the bonds that have not been maximized, while at concentrations higher than 30%, there is excess polyisoprene so that it will reduce the overall strength of the polymer. In this condition, the value of MOR particle board is 309.09 g/mm².

2.3. Modulus of Elasticity (MOE) Test Result

The results of modulus of elasticity (MOE) tests on various concentrations of the liquid rubber MOE are as shown in Figure 3.

Fig. 4. Screw hold strength of particle board on various concentrations of liquid rubber compound.

From the picture above shows that the modulus of elasticity of the particle board increases with the greater concentration of liquid rubber compound used, reaching maximum on the use of liquid rubber compound by 30%, then decreasing on the use of higher concentration. This is because in this condition the reaction that occurs between polyisoprene in liquid rubber compound with cellulose from cocodust is optimum so that the polymer formed becomes the most elastic. At lower concentrations, the bonds that have not been maximized, while at concentrations higher than 30%, there is excess polyisoprene so that it will reduce the overall elasticity of the polymer. This showed that at 30% of the liquid rubber compound concentration the particle board is made to show the highest flexibility. In this condition, the modulus of elasticity of the particle board is 182.07 g/mm².

2.4. Test Results of Screw Hold Strength

The result of testing the screw hold strength on the particle board at various concentrations of the liquid rubber compound is as shown in Figure 4.
From the picture 4 shows that screw hold strength of particle board is increased on increasing the concentration of liquid rubber compound and reaching the maximum value on the use of liquid rubber compound of 30% then decrease at higher concentration. At the best conditions the value of screw hold strength is 16910 g/mm$^2$.

2.5. Thermal Test Result (DTA-TG)

The results of thermal testing (DTA-TG) of particle board at various concentrations of liquid rubber compound are as shown in Figure 5.

Fig. 5. Thermal test results of particle board at various concentrations of liquid rubber compound.

From the DTA-TG curve above shows that the particle board of cocopeat composite with liquid rubber compound has thermal resistance up to 240 °C, this is evident from the composite mass unchanged to that temperature. At the temperature of 240 degrees Celsius, the polymer will begin to become soft and then undergo degradation by releasing volatile components such as CO$_2$ and H$_2$O. From the curve above also seen that from temperature of 240 °C to 450 °C thermal decomposition occurs and thermal composite decomposition shown from the decrease of composite mass and this process occurs exothermal which is shown by an increase in the DTA curve.

C. Conclusion

The concentration of liquid rubber compound greatly affects the chemical and mechanical properties of particle board. The best condition was obtained on the use of liquid rubber compound with concentration of 30%. Under the best conditions of the Modulus of Elasticity (MOE), the Modulus of Rupture (MOR) and the strength of the screw are 182.27 g/mm$^2$, 618.18 g/mm$^2$ and 16910 g/mm$^2$, respectively. TGDTA testing results show that the heat resistance of particle board is 240 °C.

D. Experimental Section

The experiment begins with the manufacture of liquid rubber compounds by mixing the concentrated latex with various compound additives comprising activator, accelerator, stabilizer, volcanic ator, antioxidant and filler [8]. Furthermore, a particle board test piece of 10 x 5 x 7.5 cm was prepared by mixing cocopeat with certain grain size with liquid rubber compound at various concentration of are 10%, 20%, 30%, 40% and 50% then dried. The next step is to test the mechanical properties of particle board that have been made include modulus of elasticity (MOE), modulus of rupture (MOR), screw hold strength and DTA-TG thermal test in accordance with SNI 03-2105-2006 with prior pressing particle board to obtain a thickness of 2.5 cm. The experiment of making particle board is done in chemistry laboratory, Faculty of Mathematics and Natural Sciences, University of Bengkulu, while for testing of MOR, MOE and screw hold strength are done in laboratory of material, Faculty of Mechanical Engineering Gadjah Mada University Yogyakarta. Thermal testing (DTA-TG) is done in material laboratory of Leather Technology Academy, Yogyakarta.

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