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entitled :

Tensile Strength of Car Spoiler Product Based on ABS Plastic Material

in the 3rd Nommensen International Conference on Technology and Engineering
25-26 July 2019, Medan, Indonesia

Dr. Haposan Siallagan, SH., MH
Rector

Dr. Mula Sigiro, M.Si., Ph.D
Chairman

Conference Organization

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OPENING SPEECH

First, I would like to say thank you for the actualization of 3rd Nommensen International Conference on Technology and Engineering (NICTE) 2019 in University of HKBP Nommensen. Big thank for God who leads this conference so that it can be done on July 25-26, 2019 in Library University of HKBP Nommensen, Medan. I welcome all the participants of this conference and all the people who participate in the 3rd NICTE 2019, namely: the keynote speakers, the authors, the reviewers, the dean of University of HKBP Nommensen, and for the special participant- all committee of this conference.

Then, I am glad to show my appreciation for all the Universities which have joined in this conference that come from some countries. I thankful for the sponsore, companies or institutions or others which have supported this 3rd NICTE, especially for Faculty of Engineering in University of HKBP Nommensen. I address my special appreciation for Dr.Mula Sigiro, M.Si, PhD as the Chairman of 3rd NICTE 2019 and for the co-chairman, secretary, members, and all the staff who have given their contribution for completing and finishing this conference.

In this conference, all the participant have submitted many various paper. It talks about science, technology, and engineering. All the papers are very useful to be applied in our country to give a better change for the technology and all the things which can support the progress of this country. By making a research in some topics, it should be the way how the participant can increase and create the knowledge in technology and engineering.

3rd NICTE 2019 will be a great conference for all the participants. It will be guided by the moderator, plenary speaker, or PIC. I hope that all the participants can give the best in this conference and feel so comfortable during the conference from the beginning until to the end of this conference. I also believe that all people here can collaborate well to make this conference is good to be followed.

Finally, I would like to express my hope that there will be the 4th NICTE 2020 and it should be applied to make the good development in technology and engineering. Thank you very much and enjoy the time for following this International Conference.

Rector,

Dr.Haposan Siallagan, SH, MH
University of HKBP Nommensen Medan
July 25, 2019

PREFACE

First of all, give thanks for God's love and grace for us in His helping to complete this International Conference. Second one, I would like to say thank you for all the committee, speakers, authors, reviewers, and all the participants who make the good cooperation to actualize this event. On behalf of the 3rd Nommensen International Conference on Technology and Engineering 2019, I would like to welcome all the participants to join us in this conference. The conference will be held in Library of University of HKBP Nommensen, Medan, North Sumatera, on July 25-26, 2019. This conference is organized by Faculty of Engineering of University of HKBP Nommensen, Medan.

The theme of the 3rd NICTE 2019 is **"Innovation and Application of Interdiscplinary Research in Science, Technology and Engineering".** The theme is selected with the aim to improve the technology and getting some innovations to develop the research in each parts. Research in science, technology, and engineering are needed to be done which can fulfill the development of our country in era globalization. After this conference, all the participants are hoped that they have a willing to create the new idea, new research, and new innovation to support and to contribute in technology development, especially for Indonesia country.

For this opportunity, I would like to appreciate all the contribution of participants which have submitted the paper in this conference. Many interesting topics and material which have been made by the authors. There seven topics can be divided in 3rd NICTE 2019, consist of: Civil and Environment Engineering, Mechanical Engineering and Technology, Electrical and Electronic Engineering, Material Science and Engineering, Food and Agriculture Technology, Informatic Engineering and Technology, and Medical and Health Technology. Every paper has been categorized into one of topics part. It would be checked by the reviewers in completing the result of each papers. Then, there four keynote speakers in the conference and they come from Korea, Taiwan, Malaysia, and Indonesia, namely: Prof.Tseng, Chung-Jen, PhD, Dr.Ing Azis Boing Sitanggang, Prof In Kyo Kim, and Dr. Mira Kartiwi. All the speakers come from the different department also. In this conference, We also have 145 papers from 5 countries. Great opportunity for all participants to meet with the four keynote speakers and thank you for the speakers who will join us in the third conference.

Finaly, I hope that all participants can enjoy a conference and make the best thing for presenting the paper, and eager to follow every agenda which has been made by the committe. Thank you for the good collaboration.

Dr. Mula Sigiro, M.Si, PhD
Chairman of 3rd NICTE 2019

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Tensile strength of car spoiler product based on ABS plastic and rattan fiber epoxy composite materials

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Tensile strength of car spoiler product based on ABS plastic and rattan fiber epoxy composite materials

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Abstract. This study aims to obtain the tensile strength of the car spoiler product material made from ABS Plastic. Spoiler products are obtained from free markets that produce car accessories. Tensile strength obtained will be used as comparative data for the development of composite material based spoiler car products reinforced with rattan fiber with epoxy matrix. Tensile strength testing refers to the ASTM D3039/D3039M testing standard. Based on the results of the study, the average tensile strength of ABS Plastic obtained was 34.61 ± 0.67 MPa with an average strain of 5.53 ± 0.89 mm/mm. The average tensile strength of rattan fiber epoxy composite obtained was 26.71 ± 1.18 MPa, while the strain is 4.48 ± 0.87 mm/mm.Based on the results of SEM testing, it can be seen that the material is a little void due to the manufacturing process. Voids that occur will reduce the strength of the spoiler product. The results of this study will be one of the references in product development for car spoilers. Keywords: tensile strength, SEM, car spoiler products.

1. Introduction

The development of automotive products in Indonesia opens opportunities for the development of supporting components and accessories components. One of the accessories products that are widely used is car spoiler (Figure 1). A car spoiler is an accessories component that has two functions, car aerodynamics and aesthetics [1], [2], [3], [4]. Spoilers can reduce the drag when the car moves on the highway with a certain speed. The resistance test is carried out by testing in the wind tunnel [5], [6], [7], [8], [9]. Most spoiler products in Indonesia are made from plastic materials, especially ABS plastic. Spoilers have the opportunity to be developed using other materials, especially Indonesian natural fiber composites.This study aims to develop a rattan fiber-reinforced composite material with an epoxy polymer matrix to be implemented in the development of automotive component products especially car spoiler products. This study aims to produce good quality products with cheap prices and utilizing the local potential of Indonesia which is abundant and has not been utilized properly [1], [10], [11], [12]. The focus of this research is to obtain the tensile strength of the car spoiler product material currently on the market, as comparative data in preparing replacement materials. Tensile strength data will be used as a comparison material in the development of composite spoiler car product with rattan fiber reinforced with epoxy matrix.

Figure 1. Car spoiler product

2. Method and materials

The test sample is made from ABS Plastic and epoxy rattan fiber composite material by hand. The composite material ismade from woven rattan fiber and then laminated with epoxy resin. Test methods implemented to obtain tensile strength refer to ASTM D3039 / D3039M from epoxy rattan fiber composite test samples (Figure 2) and automobile spoiler products based on ABS Plastic from the free market (Figure 3) [1], [10], [12]. To observe the condition of the test sample, a morphological test is performed by Scanning Electron Microscope (SEM) [13], [14]. Tensile testing is done with speed of 5 mm/min, using Universal Testing AGS-G testing machine. The temperature of the test chamber is 23^0C with 52% humidity. The pressure of the Pretension Universal Testing machine is set at 0.5 MPa. Test samples are not given special treatment and tested immediately after being cut from spoilers.

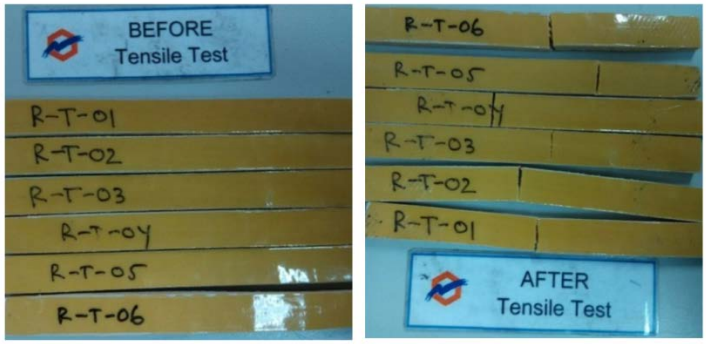

Figure 2. Sample test of car spoilers made from rattan fiber epoxy composite material

Figure 3. Sample test of car spoilers made from ABS plastic material and universal testing

3. Results and discussion

This research aims to develop car spoiler products with natural fiber composite materials, especially rattan fiber. Spoilers are much needed as a component of car accessories so that the car has a good look. The need for car spoilers opens up opportunities for the development of

car spoiler products from alternative materials, especially natural fibers that are abundant in Indonesia. The development of new materials requires reference of the mechanical characteristics of materials for the manufacturing of new spoiler products. In this case, a reengineering process has been carried out on products that are already on the market. In this reengineering process, tensile testing of spoiler product material has been carried out [4], [15].

Based on the result of tensile strength test (Figure 4), the average tensile strength of ABS Plastic material is 34.61 ± 0.67 MPa and strain:5.53 ± 0.89 mm/mm.

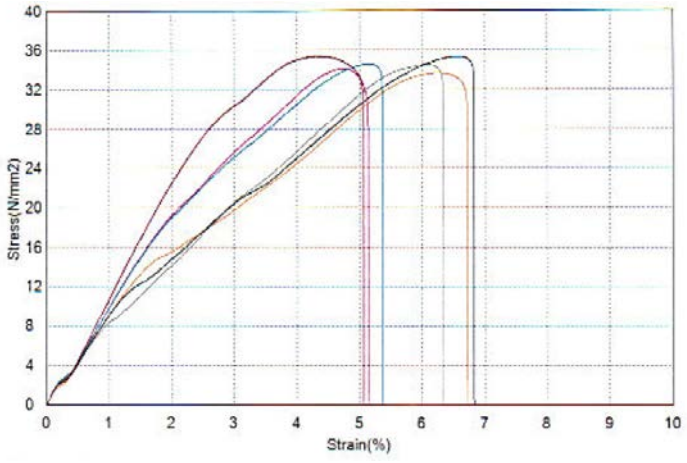

Figure 4. Tensile strength and strain of ABS plastic material from spoiler product

Table 1. Tensile strength and strain of spoiler car made from rattan epoxy composites materials

Sample	Tensile strength (MPa)	Strain (mm/mm)
1	23.78	1.95
2	23.45	3.82
3	24.99	2.89
4	24.43	3.32
5	26.71	4.48
6	24.05	2.94
Average	24.57	3.24
Maximum	26.71	4.48
SD	1.18	0.87

The maximum tensile strength of rattan epoxy composites material is 26.71 ± 1.18 MPa, while the strain is 4.48 ± 0.87mm/mm.Based of the test result, there is a difference in tensile strength of 22.8%. The difference in the results of tensile testing can occur due to the selection of an incorrect test sample. The greatest tensile strength will be obtained from continuous fiber composites carried in the direction of the fiber direction. The selection of test samples is very important to produce good tensile strength. The differences in tensile strength also occur due to voids in epoxy fiber rattan composite material test samples. Void in composite materials will result in a decrease in tensile strength.The improvement of the epoxy rattan fiber composite manufacturing process can improve the tensile strength. The Scanning Electron Microscope (SEM) analysis of the ABS plastic test sample (Figure 5) shows that the

material interface is better compared to the epoxy rattan composite (Figure 6) [1], [12], [16], [17]. Voids are more common in epoxy rattan composite material. It is necessary to refine the manufacturing process of epoxy rattan fiber composite materials so that the strength difference can be reduced and the voids that occur can be reduced. A good spoiler design will increase the comfort and ergonomics of the car. Therefore, it is necessary to design and choose spoiler material that can increase the comfort and safety of the car [4], [15].

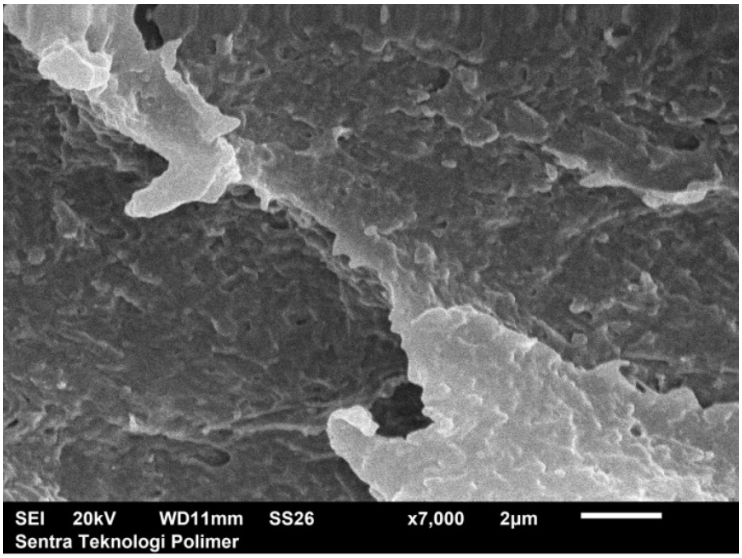

Figure 5. Morphological analysis of spoiler product from ABS Plastic by SEM

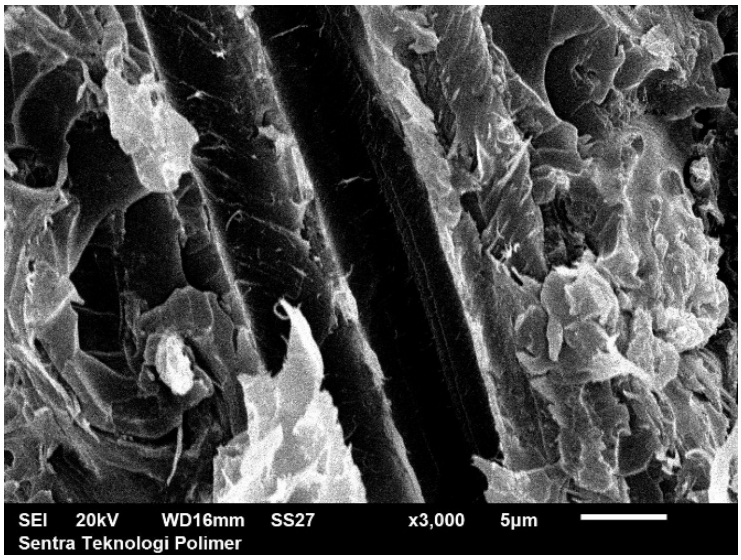

Figure 6. Morphological analysis of spoiler product from epoxy rattan fiber composite material by SEM

4. Conclusion

A research has been conducted to obtain the tensile strength of epoxy rattan fiber composite material as an alternative material for making car spoiler products. As a comparison data is the tensile strength of car spoiler products with ABS plastic materials that

are widely obtained in the free market. The tensile strength difference is 22.8%. The tensile strength of the epoxy rattan fiber composite makes it possible to be used as a material for automobile spoiler products by improving the manufacturing process.

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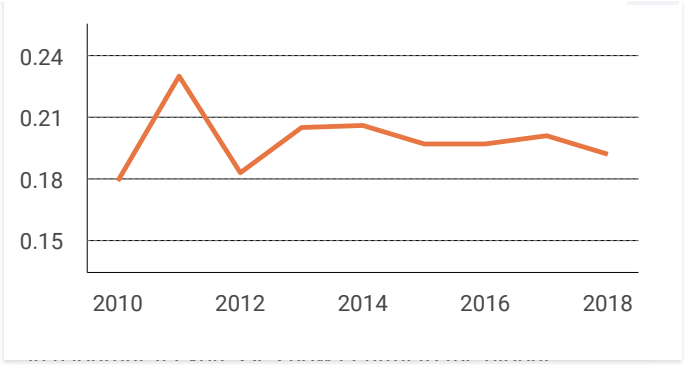
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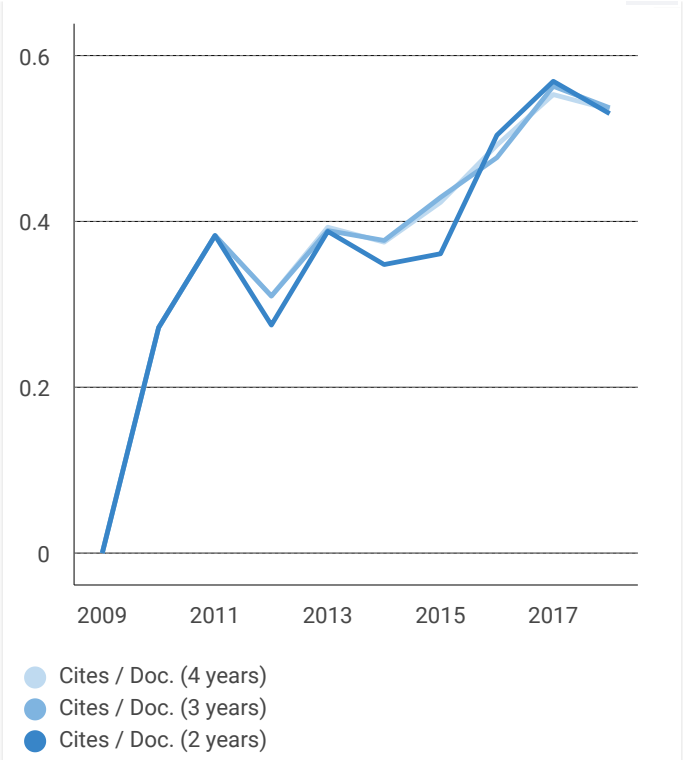
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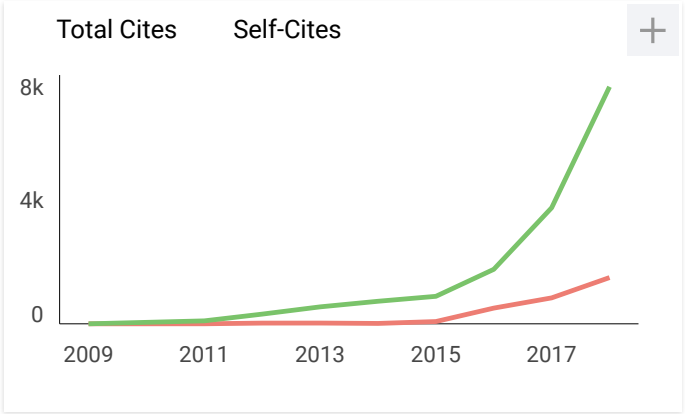
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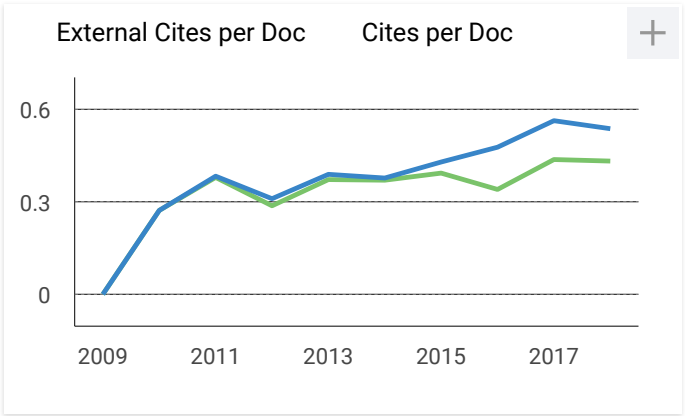
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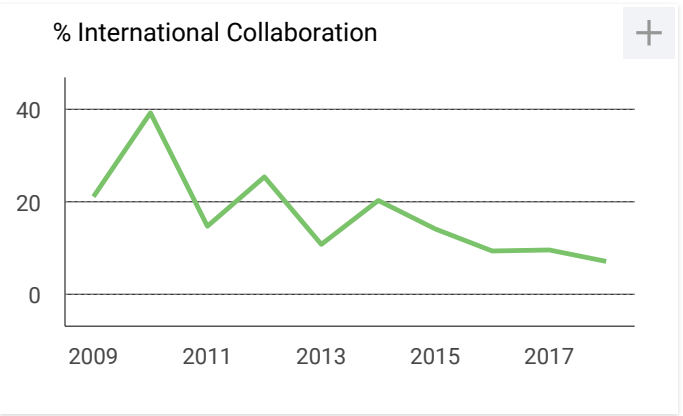
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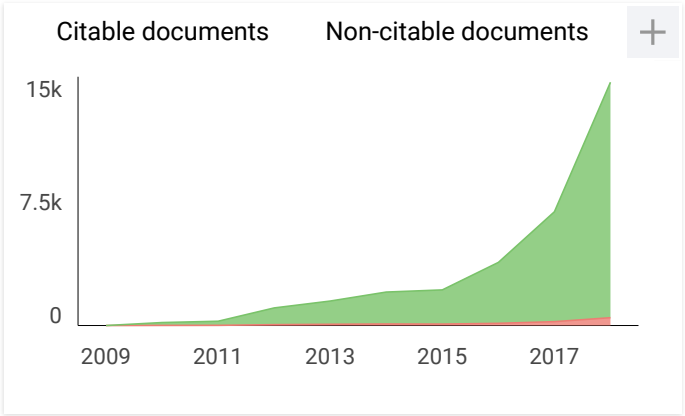
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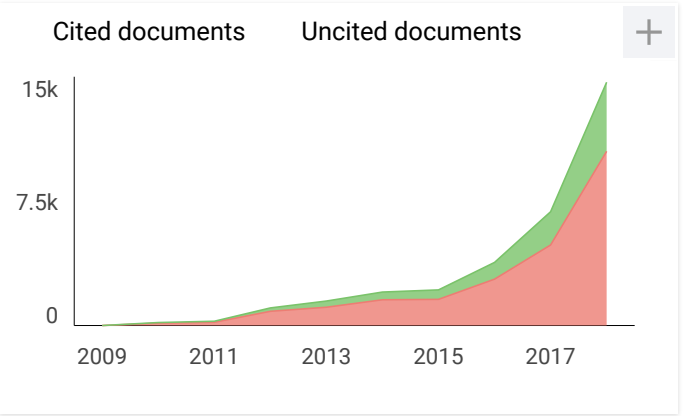
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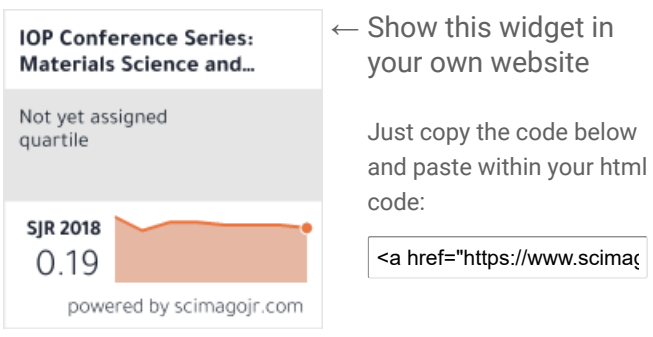
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