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FOREWORD

I am pleased to put into the hands of readers Volume-5; Issue-11: 2018 (Nov, 2018) of **"International Journal of Advanced Engineering Research and Science (IJAERS) (ISSN: 2349-6495(P) | 2456-1908(O)" ,** an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers. Now journal has also been indexed in **Qualis (Interdisciplinary Area) (Brazilian system for the evaluation of periodicals, maintained by CAPES).**

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Swapnesh Taterh
Editor-in-Chief
Date: Dec, 2018

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Analysis of UV-B Absorption by Fiber Plastic/Glass with Various Colors using UV-VIS Spectrometer

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Abstract *— Sunlight is the main source of light for living things on earth. Sunlight contains various spectra of electromagnetic waves including ultraviolet and visible light. Various effects of UV B radiation are already known. This study aims to determine the absorption characteristics of UV-B of several transparent materials. The transparent materials used in this study are fiber plastic and mica film plastic in blue, green and natural. To find out the absorption spectrum of the transparent material, the researcher used a UV-Vis spectrometer. Measurement data shows that glass fiber and the blue mica film POP-1 materials have very strong UV-B absorption which is more than 90%. While other mica film materials have various UV-B absorption at the beginning and at the end of the various UV-B spectrum with 70% values. Blue Mica film POP-1 material has absorption of about 94%. Green NIPON mica film material has 86% absorption at the beginning of the spectrum and about 82% at the end. The absorption of materials towards UV-B radiation is not linear with the increased wavelength.*

Keywords *— UV-Vis Spectrometer Absorption, Fiber Plastic, Mica Film plastic.*

I. INTRODUCTION

Sun is the biggest main source of universe that will never run out (Rahman dan Prajitno, 2013: 1).

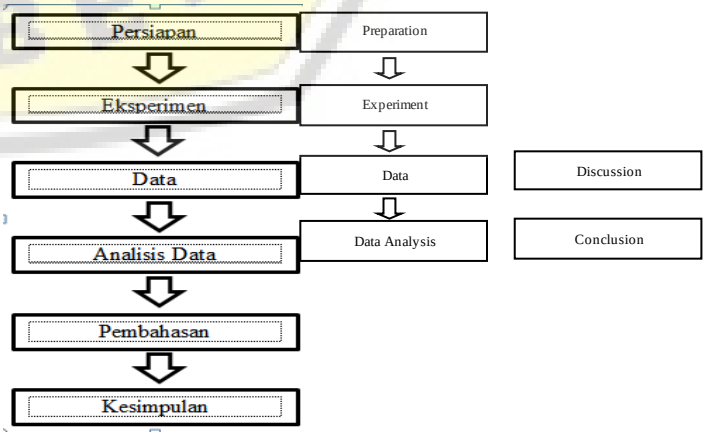
The fact about the depletion of the ozone layer in the atmosphere (Madronich et al., In Haapala et al., 2010: 370; Herman et al., In Flint and Caldwell, 1995: 107;) has an impact on increasing levels of ultraviolet exposure that reaches the earth's surface which has been widely conveyed in research in recent decades (McKenzie at al., in Holzinger and Lütz, 2006: 191; Seidlitz et al., in Holzinger and Lütz, 2006: 191). The concentration of the ozone layer is most influential in the UV-B region which includes ultraviolet whose energy is high enough (Caldwell et al. In Hollósy, 2002: 179). UV-B can cause cancer through mutations in DNA cells (Panchuau and Tiwari, 2008: 128-136). The same thing was also conveyed by Kataria et al. (2014: 2) that the disruptive effects of UV-B radiation on photosynthesis and its production level in plants are well aware.

This study is to describe the UV-B absorption to some transparent materials with various colors.

II. METHOD OF RESEARCH

- **Research Variables**
  - Free variables: type of material, color of material, brand of sample
  - Dependent variable: absorbance of the material.
  - Control variable: light intensity from the spectrometer light source.
- Tools and materials
  - Spectrometer
  - Transparent material of fiber glass: CHLADIANPLAST and Square brand with 3 kinds of colors, dark blue, dark green, and natural.
  - Transparent material for plastic mica film: POP-1 and NIPON brands in blue, green and natural.
- **Research Flow**

Figure 1. Research Flow



- **Research Step**

Research steps are as follows:

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a. Prepare the tools and materials

Things to do before conduction research are:

1. The spectrometer should be in calibrated already
2. Prepare the transparent materials with 2 cm x 2 cm of size

b. Research

After the tools and materials are prepared, the research can be done by measuring the absorbance of each color and material.

c. Data Analysis

The data obtained from the spectrometer is analyzed and calculated in Excel of MS. office then the data is processed and presented in graphical form so that it is easy to discuss.

d. Discussion

After analyzing the data, the researcher knows the characteristics of the material and can discuss the characteristics in accordance with the theories that have existed before or produce something different.

e. Conclusion

Later, the researcher concludes the finding of the research

- Data presentation Technique

Data measurement of spectrometer is presented in the form of graphic as follows:

Figure 2. Graphic of absorption measurement data

III. FINDINGS AND DISCUSSION

Measurement of data in this study is carried out in June 2017 at the Analytical Chemistry Laboratory of the Chemical Program of the FMIPA Bandung Institute of Technology. From the measurement data that has been processed in Microsoft Excel software and presented in graphical form as shown in Figure 3.

Based on the graph in Figure 3, we can know the absorption characteristics of each transparent material in the UV-B spectrum range. Fiber Glass Square material shows the absorption character that goes up and down around the value of 4 to 3.5 absorbance scale except in the natural fiber glass square material which has value absorption about 2 absorbance scales. It can be said that these ingredients have a fairly uniform absorption throughout the UV-B spectrum.

Meanwhile the fiber glass CHLADIANPLAST material has absorption characteristic with various values. The characteristic of the blue CHLADIANPLAST fiber glass material is almost similar to the color fiber glass Square material that has going up and down value between 4 up to 3.5 absorbance scale. Meanwhile the green CHLADIANPLAST fiber glass material has absorption with a value of around 3 at the beginning of the UV-B spectrum and then propagates down to close to the 2.7 absorbance scales in the range of UV-B spectrum which eventually returns up to close to the 3 absorbance scales in the end of the UV-B spectrum. In contrast to natural CHLADIANPLAST fiber glass material which has a slightly steep absorption characteristic that has value of 1.7 absorbance at the beginning of the UV-B spectrum and drops to close to 1.3 at a wavelength of 288 nm then decreases again until it approaches the value of 1 absorbance scale at the end of the UV-B spectrum.

In mica film materials, the absorption character tends to decrease along the UV-B spectrum. At the beginning of the UV-B spectrum, the values range from 0.59 to 0.45 absorbance scale are green POP-1 brand mica film material with a value of 0.59 absorbance scale, natural color POP-1 mica film material with a value of 0.45 absorbance scale, blue NIPON brand mica film material with 0.57 absorbance scale, and natural color NIPON brand mica film material with a value of 0.4 absorbance scale. Up to the end of the spectrum UV-B shows varies values which are slightly between 0.45-0.15, they are green POP-1 mica film brand material with a value of 0.4 absorbance scale, natural color POP-1 mica film material with value of 0, 2 absorbance scales, blue NIPON brand mica film material 0.3 absorbance scale, and natural color NIPON brand mica film material with a value of 1.4 absorbance scale. A somewhat different thing is found in the blue POP-1 mica film material and the green NIPON mica film. The blue Mica film POP-1 material has a value of almost 1.2 at the beginning of the UV-B spectrum and then decreases gently in the middle of the UV-B spectrum to close to 1 in the absorbance scale and rises again to 1.2 in the absorbance scale. Meanwhile the green NIPON mica film has a value of 0.8 at the beginning of the UV-B spectrum and tends to decrease until the end of the UV-B spectrum with a value of 0.7 absorbance scale.

In all types of materials, all natural color ingredients have a lower absorption than those similar materials with other colors. This is due to the presence of dyes which influence the absorption of the colored materials. All ingredients can be said to have absorption characteristic of the UV-B spectrum which is relatively even though each ingredient has different fluctuations, can tend to decrease or go up and down indefinitely. However, each ingredient has absorption with different values.

All brand and color fiber glass material examined in this study have very strong UV-B absorption with a value of more than 1, which means that these materials absorb more than 90% of UV-B radiation. The same thing is in the blue POP-1 mica film material which has more than 90% UV-B absorption. Almost all fiber glass

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materials but natural CHLADIANPLAST fiber glass have UV-B absorption up to around 99%. Meanwhile mica film materials have absorption values of around 0.5 or below which means that this material only has UV-B absorption of about 70% while the remaining 30% or more is transmitted. 30% can be very large if you see the nature of UV-B which has high energy and can be dangerous. For the blue POP-1mica film material and green NIPON mica film material have higher absorption value than the majority of other mica film materials. Blue POP-1 mica film material has a value of almost 1.2 at the beginning of the UV-B spectrum which is equivalent to UV-B absorption of 94% and then sloping downward in the middle of the UV-B spectrum to close to the value of 1 absorbance scale or absorb UV-B 90% and back up to 1.2 absorbance scale at the end of the UV-B spectrum. Meanwhile the green NIPON mica film has a value of 0.8 at the beginning of the UV-B spectrum which is equivalent to UV-B absorption of more than 86% and tends to decrease until the end of the UV-B spectrum which has UV-B absorption of 82% or has 0.7 value of absorbance scale.

From the graph, we can find that for materials with different types of thickness cannot be used as a definite measurement that materials with smaller thickness will have smaller absorption as well. This can be seen in blue POP-1 mica film plastic material and natural color CLADIANPLAST fiber plastic material where both of these materials have almost the same absorption even at the end of the UV-B spectrum of thinner POP-1 mica film which has greater absorption than absorption of natural fiber glass CHLADIANPLAST.

The absorption characteristic material towards UV-B radiation is non-linear with the increase of wavelength along the UV-B spectrum range. In all types of materials and each color have unique and distinctive fluctuations.

IV. CONCLUSION AND SUGGESTION

Based on the above discussion, it can be concluded that the UV-B absorption of all blue fiber glass and mica film POP-1 materials are very strong of more than 90%. Whereas other mica film materials have UV-B absorption which are varies at the beginning and at the end of the UV-B varied spectrum with value of about 70%. Blue POP-1 mica film material has absorption of about 94%. Green NIPON mica film material has absorption of around 86% at the beginning of the spectrum and around 82% at the end.

The absorption characteristic of material towards UV-B radiation is non-linear with the increased wavelength that has unique and special fluctuations. However, it can be said to have a uniform absorption along UV-B spectrum. Materials that have natural colors have a lower absorption than similar materials that have other colors.

This study uses several brands that are available on the market from different factories with the way they are that differs the samples that cannot be avoided such as the unequal thickness, dyes that can be different, and differences in surface texture. In order to deepen knowledge about this topic, further research needs to consider the influence of the surface texture of the transparent material and try samples that have the same thickness and coloring.

REFERENCES

[1] Flint, S. D. Dan Caldwell, M. M. 1996 Scaling Plant Ultraviolet Spectral Responses from Laboratory Action Spectra to Field Spectral Weighting Factors. *J. Plant Physiol*. Vol. 148: 107-114.

[2] Haapala, Morsky, Saarnio, Suokanerva, dan Kyro. 2010. Long-Term Effect of Elevated UV-B Radiation on Phtosynthesis and Ultrastructure of Eriophorum Russeolum and Warnstorfia Exannulata. *Science of Total Environment*. Vol. 409: 370-377.

[3] Hollósy. F. 2002. Effects of Ultraviolet Radiation on Plant Cells. *Micron*. Vol. 179-197.

[4] Holzinger, A. Dan Lütz, C. 2006. Algae and UV Irradiation: Effects on Ultrastructure and Related Metabolic Funtion. *Micron*. Vol 37: 190-207.

[5] Kataria, S., Jajoo, A., Guruprasad, K. N. 2014. Impact of Increasing Ultraviolet-B (UV-B) Radiation on Photosynthetic Proseses. *Journal of Photochemistry and Photobiology B. Biology*. At elsevier: 1-46.

[6] Panchuau, Z. dan Tiwari, R. C. 2008 Ultraviolet Light-it's Effects and Applications. *Science Vision*. Vol. 8 (4): 128-136.

[7] Rahman, H. dan Prajitno, Gontiang. 2013. Pengaruh Pemberian Space (Bantalan) Untuk Mendapatkan Kestabilan Arus dan Tegangan Prototipe DSSC dengan Ekstraksi Kulit Buah Manggis (Garcinia Mangostana L.) Sebagai Dye Sensitizer. *Jurnal Sains dan Seni POMITS*. Vol. 1 (2): 1-7.