

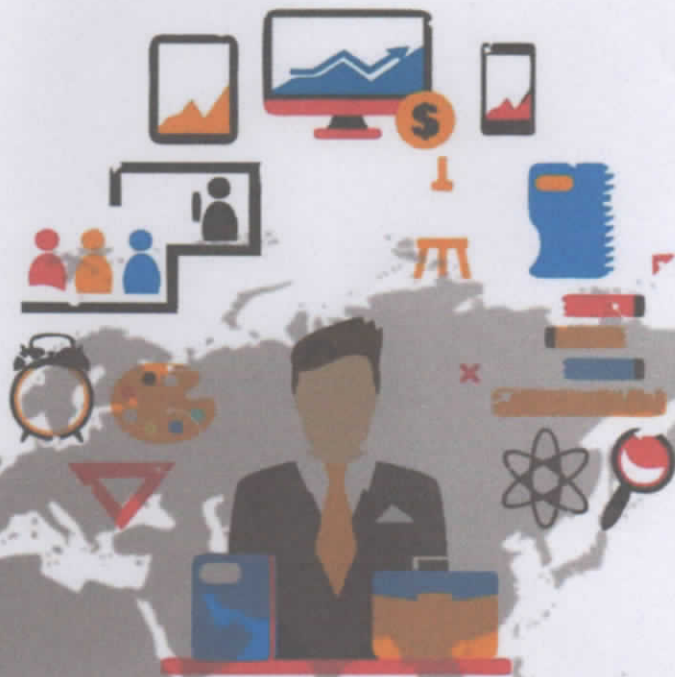
1st International Conference

ORGANIZED BY



Fakultas Matematika dan Ilmu Pengetahuan Alam
Universitas Muhammadiyah Semarang

E DUCATION
S CIENCE
T ECHNOLOGY



**“Science Education and Measurement
Using Big Data for Society 5.0”**

1 December 2020|ZOOM

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Greetings from the Dean

Welcome to the first International Conference

Education, Science, and Technology (EDUSAINSTECH)

The first EDUSAINSTECH international seminar was organized by the fakultas matematika dan ilmu pengetahuan alam, Universitas Muhammadiyah Semarang (UNIMUS). The theme of this seminar is "SCIENCE EDUCATION AND MEASUREMENT USING BIG DATA FOR SOCIETY 5.0". This seminar was held virtually on Tuesday 1 December 2020. This conference is to gather researchers, practitioners, students, experts, consultants, teachers, and lecturers to share knowledge and research experiences. EDUSAINSTECH is here to answer the problems of education and measurement of science in society 5.0 using big data. EDUSAINSTECH promotes the strength of collaboration between academics and educational professionals. The conference invited national and international participants to actively share various fields of education and collectively contribute to shaping a much better education future.

Dr. Eny Winaryati, M.Pd

Dean of Faculty of faculty of mathematics and natural science
Universitas Muhammadiyah Semarang

Conference Schedule

December 1st, 2020

Indonesia Time (GMT + 7)	Activity
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06.30 am - 07.30 am

Registration

07.30 am - 08.00 am

Opening ceremony

Prof. Dr. Masrukhi M.Pd

Rector of Universitas Muhammadiyah Semarang

08.00 am - 08.30 am

Award Submission

08.30 am - 08.50 am

Keynote Speaker

Prof. Abdul Mu"ti, M.Ed

Head of National Education Standard Board

**Plenary Session 1
(Assessment)**

08.50 am - 09.15 am

Dr. Eny Winaryati, M.Pd

Universitas Muhammadiyah Semarang
Expert of Assessment and Evaluation-Indonesia

09.15 am - 09.35 am

Dr. Amelia T. Buan

Mindanao State University- Phillppines
Expert Assessment for Remote Teaching

09.35 am - 10.00 am

Prof. Khusaeri, M.Pd

Member of Association Educational Evaluation Indonesia
Expert of Learning Assessment

10.00 am - 10.15 am

Discussion

Plenary Session 2 (Applied Science)

10.15 am - 10.30 am

Prof. Muhammad Nur, DEA

Diponegoro University-Indonesia
Expert of Learning Assessment

10.30 am - 10.55 am

Dr. rer.pol. Dedy Dwi Prastyo, M.Si

Institut Teknologi Sepuluh Nopember-Indonesia
Expert of Big Data Field

10.55 am - 11.10 am

Discussion

Plenary Session 3 (Education)

11.10 am - 11.35 am

Assoc.Prof.Dr. Haniza Hanim binti Mohd Zain

Universitas Pendidikan Sultan Indris-Malaysia

Expert of Teaching and Learning in Higher Education

11.35 am - 11.55 am

Assoc. Prof. Chatree Faikhamta, P.hD

Kasetsart University-Thailand
Expert of Science Education

11.55 am - 12.15 pm

Discussion

12.15 am - 01.00 pm

Lunch Break

01.00 pm - 03.30 pm

Parallel Session 1-15

03.45 pm

End

Paper Presentation Schedule

Parallel Session : **Science and Technic 1** Kode Room : **ST_1**
 Host : Indah Manfaati Nur, M.Si
 Chairperson : Ina Solihati
 Link zoom : Meeting ID: 964 1692 1312 Passcode: unimusgo

SCEDULE FOR PAPER PRESENTATION

Time	Paper ID	Presenter Name	Title of Paper
01.00 pm - 01.10 pm	EDUSAINSTECH 2020-12	Nilam Novita Sari	BR+ for Addressing Imbalanced Multilabel Data Classification Combined with Resampling Technique
01.10 pm - 01.20 pm	EDUSAINSTECH 2020-14	Christian Yulianto Rusli	Testing the DeLone and McLean Models of the Application of the Information System for New Student Registration at the Junior High School Level in Peklaongan City
01.20 pm - 01.30 pm	EDUSAINSTECH 2020-18	Narita Yuri Adrianingsih	Modeling Using a Fourier Series Approach in The Case of Open Unemployment Rate in East Nusa Tenggara
01.30 pm - 01.40 pm	EDUSAINSTECH 2020-36	Andi Muhamad Iqbal Akbar Asfar	Identification of Polyphenols in Sappan Wood Extract (Caesalpinia sappan L.) Results of Ultrasonic Assisted Solvent Extraction
01.40 pm - 01.50 pm	EDUSAINSTECH 2020-43	Nilam Novita Sari	Analysis of Adolescent Risk Behavior of Premarital Sex and Drug Consumption in East Java using Multilabel Random Forest
01.50 pm - 02.00 pm	EDUSAINSTECH 2020-51	Ana Hidayati Mukaromah	The Potential of <i>Moringa oleifera</i> Seed Powder (Msp) as a Substitute for ZSM-5 on Synthesis of The Msp/TiO₂ Membrane to Reduce Cu(II) Ion Concentration on Batik Industrial Waste in Pekalongan
02.00 pm - 02.10 pm	EDUSAINSTECH 2020-59	Widiyono	Watermarking Techniques using Least Significant Bit Method in Batik Motif Images
02.10 pm - 02.20 pm	EDUSAINSTECH 2020-60	Eny Jumiaty	The Effect of Additional Comfortability Attributes on Usability Testing
02.20 pm - 02.30 pm	EDUSAINSTECH 2020-68	Era Yuniyanto	Marketplace Selection Strategy with Integration of Fuzzy Ahp and Fuzzy Moora Methods
02.30 pm - 02.40 pm	EDUSAINSTECH 2020-91	Baihaqi Siregar	Internet of Things Based Infusion Fluid Level Monitoring System

EDUSAINSTECH 2020
The 1st INTERNATIONAL CONFERENCE
EDUCATION, SCIENCE, AND TECHNOLOGY
Faculty of Science and Mathematics
UNIVERSITAS MUHAMMADIYAH SEMARANG,
1ST DECEMBER 2020



1st International Conference

Education, Science, and Technology (EDUSAINSTECH)

**RULES AND SCEDULE FOR PAPER PRESENTATION
OF EDUSAINSTECH VIRTUAL CONFERENCE 2020**

EDUSAINSTECH 2020 | 01 DECEMBER 2020

Organized By:



RULES OF EDUSAINSTECH VIRTUAL CONFERENCE 2020

1. All participants and presenters must wear neat and polite clothes
2. All participants and presenters must join the Zoom Meeting on December 1st, 2020 at 07.00 am Indonesia Time (GMT+7).
3. All participants and presenters must change the Meeting ID according to the Room parallel session and category as follows :
 - a. Room Code + Presenter + Full Name (Example: Ed_1 Presenter Irda Nur Hidayat)
 - b. Room Code + Participant + Full Name (Example: SH_1 Participant Nur Ainiyah)
 - c. Room Code + Committee + Full Name (Example: Ec_1 OC Samsul Arifin)
4. Participants and Presenters is allowed to change the appearance of the back screen (Virtual background) with the Virtual background image that has been sent by Committee. The ways to access the Virtual background image are as follow :
 - a. Access via PC or Notebook
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 - Click the User icon (your photo) on the top right, then click "Settings" .
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6. Participants who want to ask can write their questions via the chat feature.
7. The Parallel Session is guided by a moderator.
8. Do not leave the small group (each room) so that there is no information about the e-certificate
9. The e-certificate will be sent via email by the Committee
10. Matters that have not been stated in this code of conduct will be arranged later.

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Parallel Session : **Science and Technic 1**
 Host : Indah Manfaati Nur, M.Si
 Chairperson : Ina Solihati
 Link zoom : Meeting ID: 964 1692 1312 Passcode: unimusgo

Room code : **ST_1**

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Organized By:



Semarang, 22th November 2020

Our Ref : 051/EDUSAINSTECH/XII/2020

Subject : **Letter of Acceptance**

Dear Mrs. Ana Hidayati Mukaromah
Paper Id: EDUSAINSTECH 2020-51

Paper Title:

“The Potential of Moringa Seed Powder (Msp) as a Substitute for ZSM-5 on Synthesis of The Msp Membrane to Reduce Cu(II) on Batik Industrial Waste in Pekalongan”

Congratulations! Based on the recommendations of the reviewers and the Program Committee, we are pleased to inform you that your paper identified above has been accepted for virtual presentation. You are cordially invited to present the paper at EDUSAINSTECH 2020 which will be held on December 1, 2020. Please prepare your manuscript and send your full paper to us through the <http://edusainstek.unimus.ac.id/2020/> by December 2, 2020. Please notify the following important dates.

1.	Abstract accepted announcement	01-25 November 2020
2.	Deadline Payment	25 November 2020
3.	Video presentation (if you don't make a video presentation, you can do the presentation at that time)	30 November 2020
4.	Full paper deadline	02 December 2020
5.	Camera ready for publish	07 December 2020
6.	Conference date	01 December 2020

Registration fee

1.	Only presenter	Rp. 100,000
2.	Presenter with international proceedings	Rp. 1,750,000
3.	Presenter with Nasional proceedings	Rp. 200,000

Now you can pay the registration fee. It can be paid by bank transfer to:

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Account name: Tiani Wahyu U and Venissa Dian M

Account number: 7128893134

Note: Please send your bank transfer receipt via WA 085235004282/081230096199.

Finally, we would like to further extend our congratulations to you and we are looking forward to seeing you in our conference.

Chairperson for EDUSAINSTECH 2020

Signed by
Andari Puji Astuti

The Potential of *Moringa oleifera* Seed Powder (Msp) as a Substitute for ZSM-5 of Msp/TiO₂ to Reduce Cu(II) Ion Concentration on Batik Industrial Waste in Pekalongan

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Abstract. The ZSM-5/TiO₂ membrane is a membrane containing of ZSM-5 and TiO₂ can be used as an adsorbent for metal ions in wastewater. The price of commercial ZSM-5 is relatively expensive, so it is necessary to substitute ZSM-5 from natural plants such as *Moringa oleifera* seeds powder (Msp). The purpose of this study was to determine ratio of the amount of Msp/TiO₂ on synthesis of the Msp/TiO₂ membranes to reduce Cu(II) ion concentration maximally. The object of this research is the Msp/TiO₂ membrane with ratio of Msp/TiO₂ can reduce Cu(II) concentration in Batik industrial waste in the Pekalongan and determination the concentration of Cu(II) ion by spectrophotometric methods. The results of the study were an initial Cu (II) of 68.15 mg/L, and decrease persentation Cu (II) concentration with ratio Msp/TiO₂ membranes of 20:1; 18:3; 16:5 and 14:7 with UV irradiation time of 90 minutes and a flow rate of 0.33 mL/minute were 70.34 ± 0.85; 70.43 ± 1.12; 68.49 ± 2.28; and 68.02 ± 0.73% respectively. The effective of Msp/TiO₂ 20:1 was decrease persentation Cu (II) concentration 70.43 ± 1.12 %.

Keywords: Cu(II) ion concentration, *Moringa oleifera* seed powder (Msp)/TiO₂ membrane, Batik waste water Pekalongan

1. Introduction

Pollution in Pekalongan is caused by batik industrial waste from use of synthetic dyes in the batik coloring process. According to Pekalongan Environmental Service (DLH), the batik industry waste in Pekalongan is 5 million liters every day, but only accommodate 45% by the available Wastewater Management Installation and the rest is wasted into the river [1]. According to the Minister of Environment Regulation No. 5/2014 concerning the quality standard of textile industry waste, the maximum concentration of Cu (II) ion is 2 mg/L [2]. Cu (II) is an essential metal ion, a component of the enzyme needed to produce energy, anti-oxidation, and synthesis of the hormone adrenaline, as well as for the formation of connective tissue, and it's more than the threshold, it result in toxicity the body with symptoms of vomiting, diarrhea, jaundice, muscle pain, liver damage, heart failure, kidney failure and even death [3]. Recently studies have shown effects of copper in drinking water on the gastrointestinal tract, but there is some uncertainty regarding the long term effects of copper on sensitive populations such as carriers of the gene for Wilson disease and other metabolic disorders of copper homeostasis [4]. Therefore a solution is needed to reduce the levels of Industrial Waste using a vegetable-tannin coagulant and photocatalysis [5]; with Titanium oxide dispersed on Natural Zeolite

(TiO₂/Zeolite) [6]; *Moringa oleifera* Seeds Extract [7]; *Moringa oleifera* coagulant [8, 9]; Hybrid process of *Moringa oleifera* [10] and this research is *Moringa oleifera* seed powder (Msp/TiO₂ membrane).

TiO₂ functions as a photocatalyst because it has a filled valence band (vb) and an empty conduction band (cb) are separated by a band gap energy (Eg) which is quite high, the anatase type is 3.2 eV and the rutile type is 3.0 eV [11]. TiO₂ has a white crystalline shape, has a molecular weight of 79.8886 g/mol, the density of 4.23 g/cc, the melting point of 1843°C in the absence of oxygen and 1892 °C in the presence of oxygen, and has a boiling point of 2972 °C. TiO₂ crystals are insoluble in water and soluble in hydrochloric acid, dilute sulfuric acid and alcohol, stable at pH 4.5-8, active when exposed to light, and non toxic [9]. Modifying TiO₂ in various ways changes the mechanism, kinetics under UV irradiation, and introduces visible light activity that is absent with pure TiO₂. Each modification method influences the photocatalytic activity and mechanism in a way different from others and the observed modification effects are often different depending on the test substrates and conditions even for the same modification method [12]. The price of the commercial ZSM-5 and its precursors is relatively expensive, so it replace by natural ingredients *Moringa oleifera* seeds.

Moringa oleifera seeds contain 32.19% protein and 4-alfa-4-rhamnosyloxy-benzyl-isothiocyanate bioactive compounds [13, 14, 15,16] which are able to adsorbing and neutralizing sludge and metal particles in waste. Research by Yusrin et al. [16](2015) regarding the reduction of Fe (II) levels in artificial water using *Moringa* seeds resulting in the most effective time is 30 minute for the degradation process of Fe (II) ion 43.28%. Research report by Marhaeni [18] that TiO₂ synthesis of *Moringa oleifera* wood powder has been successfully used as an adsorbent to reduce Fe (II) concentration in water. Research by Asyyifa *et al.* [19] that ZSM-5/TiO₂ membrane with gauze support types AISI 316-180, 304-200 and 304-400 with UV irradiation time of 30, 60 and 90 minutes, the highest reduction Cu (II) concentration 57.72% using ZSM-5/TiO₂ membrane with 304400 gauze and 90 minutes UV irradiation. The purpose of this study was to determine initial Cu(II) concentration and reduction Cu (II) concentration after passing through Msp/TiO₂ membrane with weight ratio of Msp:TiO₂ were 20:1; 18: 3; 16: 5; 14: 7 with UV irradiation for 90 minutes in batik waste water Pekalongan.

2. Research Methods

2.1 Tools and Materials

The tools used are analytic Balances, UV-Vis spectrophotometer, flask, bowl, filter paper, pH meter, magnetic stirrer, sieve 100 mesh, funnel, rotator, stative, burette, mortar, furnace and Reactor with UV lamp. The reduction in Cu (II) concentrations used the photodegradation method and the Cu (II) concentration was determined by the spectrophotometric method. Materials of this study were 304-400 gauze, TiO₂, CuSO₄5H₂O, Na diethyl dithiocarbamate, HCl, NaOH, H₂SO₄, NH₄OH, and absolute ethanol (all reagent by Emerck).

2.2 Procedure

2.2.1 Gauze Treatment

Gauze 304-400 with 3 cm x 3 cm size is soaked in toluene 95% for 12 hours, then immersed in 15% HCl solution for 6 hours. Furthermore, it was immersed in 0,1M Tetrapropilamonium Bromida (TPA-Br) solution for 12 hours and was cleaned by water and dried at 110°C for 1 hour [20].

2.2.2 Preparation of Msp/TiO₂ Precursor

Moringa oleifera seeds were dried at room temperature for 24 hours, then were heated at 120°C in oven for 1 hours. Furethere Msp were grinded to powder sieved using a sieve of 100 nm [9, 18]. Msp 20 gram was added 1 gram TiO₂, 1 mL amylum 2%b/v and 20 mL alcohol 96% and were stirred using magnetic stirrer for 5 hours at at room temperature (For Msp: TiO₂ ratio 20:1). Procedure was repeated to Msp: TiO₂ ratio 18:3; 16:5; 14:7.

2.2.3 Synthesis of Msp/TiO₂ Membrane

Msp/TiO₂ precursors 20:1; 18:3; 16:5; 14:7 were coated in 304-400 gauze, it are embedded in polypropylene plastic and then heated in oven at 120 °C for 5 hours [18]. Msp/TiO₂ membrane was washed with distilled water and heated at 60 °C for 3 hours.

2.2.4 Decrease of Cu(II) Ions Concentration with Msp/TiO₂ Powder and Membrane

Batik waste water in Pekalongan was pipetted 50,00 mL is flowed into the reactor which has a Msp/TiO₂ membrane (ratio 20:1) with a flow rate 0.33 mL/minute with UV irradiation for 90 minutes and filtrate was calculated at final Cu(II) concentration. The treatment was repeated membranes Msp/TiO₂ ratio 18:3; 16:5; and 14:7.

2.2.5 Determination of Cu(II) Ion concentration with Spectrophotometer

The filtrate results is pipetted 5.0 ml into 50.0 ml volumetric flask and then added ± 35 ml of distilled water, 5.0 mL NH₄OH 5% and 5.0 mL Na-diethyl dithiocarbamate to solution volume 50,00 mL and *homogenized*. The absorbance is read using a spectrophotometer at a wavelength of 480 nm and a stability time of 5 minutes. The Procedure is repeated filtrate with filtrate from membranes Msp/TiO₂ ratio 18:3; 16:5; and 14:7 [21, 22].

2.2.6 Data Analysis

In this study, data were obtained from experiments and analyzed with descriptiv.

3. Result and Discussion

The result of research, the initial Cu(II) concentration of Pekalongan batik waste are shown in Table 1.

Table 1. The initial Cu(II) concentration

Initial Cu (II) Cocentration (mg/L)	Mean (mg/L)
68.00	68.15±0.15
68.31	
67.69	

Table 1 shows that the initial Cu (II) concentration of batik waste in Pekalongan are 68.15 ±0.15 mg/L, while the percentage reduction Cu(II) on Figure 1.

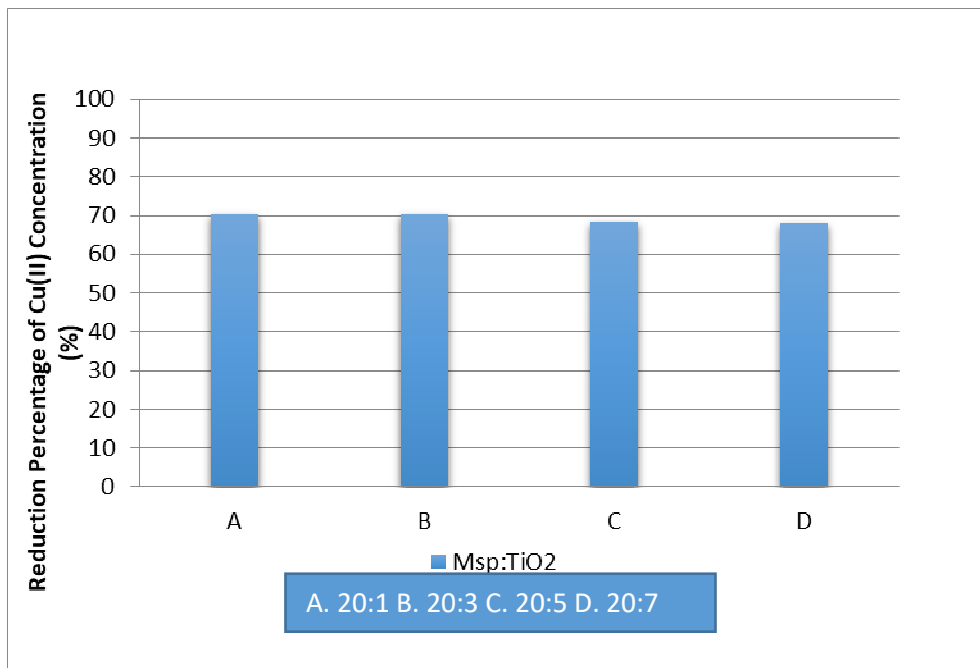


Figure 1. The percentage reduction Cu(II) concentration of batik waste in Pekalongan with Msp:TiO₂

Figure 1 shows that the percentage of decrease level of Cu(II) samples were flowed to Msp/TiO₂ membrane with ratio Msp:TiO₂ A. 20:1 and B. 18:3 on gauze support 304 size 400 mesh for UV 90 minute with flow speed 0.33 mL/minute slightly increased. The percentage of decrease level of Cu(II) samples were flowed to Msp/TiO₂ membrane with ratio Msp:TiO₂ 16:5; 14:7 there is a slightly decreased too. According to Savitri and Yulianti's research [23] and Nugroho [13] that Msp has an active group of *4-alfa-4-rhamnosyloxy-benzil-isothiocyanate* with functional group are C=O (carbonyl) and -S=C=N (isothiocyanate). Carbonyl group has one of double bond and a pair free electrone on atomic O, while isothiocyanate have two pairs free electrone and a pair free electrone on atomic N who donated electron and strong active ligand to ion-ion heavy metai ion which are electrophyl. Functional group carbonyl and isothiocyanate on Msp including as a shoft base and according *Hard Soft Acid Base* theory (HSAB) that Fe (II) as a shoft acid. Moringa oleifera seed contain protein consisting of amino acids such as glutamic acids such as glutamic acid, methionine, and arginine. Glutamic acid has a negative charge on the carboxyl. When the moringa oliefera seeds reacts with the sample solution, it will ionize to produce a hydroxyl group (-OH) has a negative charge and will blind the Cu(II) cation in the sample [24].

According to Nand *et al* [4], the adsorption of metals using Moringa is limited to the adsorption surface. The mechanism that brings about the adsorption of heavy metals is through the positive metal ion that forms a bridge among the anionic polyelectrolyte and negatively charged protein functional groups (*4-alfa-4-rhamnosyloxy-benzil-isothiocyanate*) on the colloidal particle surface and netralization negative charge Msp which will abstract positively charge such as Fe(II) ion in water. Adsorption process influlenced to fungtioanal groups, pocation of functional group, double bond, structure pair from coagulant adsorption and heavy diameter/adsorbat. Several other factore affect to adsorption are adsorben characteristic, pH solution, temperature, adsorben size and stirring time [25, 26].

The increasing TiO₂ expected to produce electrone and •OH so that it can reduce the greather Cu(II) concentration, but this study that the increasing amount of TiO₂ was followed by a decrease in the amount of Msp, so the percentage of Cu(II) concentration experienced almost the same declene. Fotoreduction TiO₂ catalysis Cu(II) influenced by several factore are rays time and dan fotocatalys

weight. Fotoreduction Cu(II) ion in Batik waste with capture electrons from water photolysis and photocatalysis TiO₂. Water photolysis produces electrons (e⁻), H⁺ and •OH, and photocatalysis TiO₂ produces TiO₂ (e⁻ + hν + •OH), and 2 •Ti-O⁻ reaction with H₂O too produces total •OH more high from water photocatalysis. Electrons and •OH produce will attack Cu(II) ion, while photoreduction processes Cu(II) to Cu(0), so that the concentration of Cu(II) is reduced [9, 25]. Based on the results of Agusty's research, TiO₂ impregnated on Zeolite (Zeolite:TiO₂=20:1) for 120 minutes can reduce Congo Red dye 81.66% which percentage reduction is greater than using zeolite or TiO₂ alone.

The Marhaeni and Rochyani's research [18] that a good ratio of Msp:TiO₂ is 3:2, the one that produces spectra (FTIR) with an asymmetric pore structure and pore size 0.1 – 6 μm. The addition of TiO₂ followed by decrease the amount of Msp, possibility an increase the symmetrical structure with a low molecular mass, so as to reduce the pore size and cause the adsorption of Cu(II) ions also decrease. This result is the same with Putri's research [27] on the synthesis of composite Msp:TiO₂ using the ratio of Msp:TiO₂ 1: 0; 1: 1,5; 1: 2; 1: 2,5 and 1: 3 results in the composite Msp/TiO₂ able to adsorption levels of COD, NH₃-N, Hg, Pb, PO₄³⁻, Fe and *E. coli* bacteria.

5. Conclusion

The result of this study it can be concluded that:

1. The initial Cu(II) level in the sample is 68.15 ± 0.15 mg/L
2. Decrease presentation Cu (II) concentration with ratio weight Msp/TiO₂ membranes of A.20:1; B. 18:3; C. 16:5 and D. 14:7 with UV irradiation time of 90 minutes and a flow rate of 0.33 mL/minute were 70.34 ± 0.85; 70.43 ± 1.12; 68.49 ± 2.28; and 68.02 ± 0.73% respectively.
3. The effectiveness percentage of Cu(II) reduction was 70.34% is membrane with the ratio of *Moringa oleifera* seed powder (Msp):TiO₂ is B. 20:1.

5. References

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