Organic Reduction in Sewage by using Colloid Micelles

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Abstract— **The organic matter is one of the materials that play an important role in the environment. The content of the organic matter may influence the capacity of water holding, ability of the soil and nutrient retention, in providing the sufficient nutrients for the growth of the plant. However, many research show that the organic matter is the major pollutant in wastewater. To reduce the organic matter in the wastewater, the colloid micelles, AD NANO, is used as the disinfectant. 7 methods are carried out in this research to determine the capability of AD NANO in reducing the organic matter in the wastewater. Other than that, the efficiency of AD NANO used based on four factors which are solution strength, time, temperature, and mechanical issues are determined. Based on the result, the GC-MS measurement show the total organic matter in the sample while FTIR measurement show the functional group that exist in the sample, which can react with the organic matter. As for the COD test, color test, TSS test, DO test, and turbidity test, the result show the decreased reading for the sample that had been poured with AD NANO. In the nutshell, AD NANO is proved to be one of the disinfectants that is capable of reducing the organic matter in the wastewater. In addition, the efficiency of this kind of treatment is determined by time and solution strength of AD NANO used, and the temperature of the sample is not affected by the use of AD NANO**

Keywords— sewage, wastewater, AD NANO, disinfectant, organic matter, colloid micelles

I. INTRODUCTION

The wastewater produced is considered as harmful substance to both of the living things and environment, and the other thing that give rise to the wastewater production is the human faeces. It is said that the organic matter is contained in every wastewater that had been produced and this compound is one of the materials that play an important role in the environment. There are two objectives of this research to be conducted. The first one is to establish the best environmental option for treating the aerated wastewater that is contained with high level of organic matter. The second one is to determine the efficiency of the colloid micelles used based on four factors which are solution strength, time, temperature, and mechanical issues.

In the research of organic reduction in sewage by using colloid micelles, the disinfection type of wastewater treatment is used. A colloid is the substances mixture that exist in very small particle [1]. There are two components that contained in the colloid. They are colloid particle and dispersion materials. The colloid particle enables the colloid to suspend in another medium while the dispersion material can distribute throughout the other component. However, the distribution of this component can only be seen by using electron microscope [2]. Other than that, micelles are a molecule that is relatively small and it is formed when the combination of different molecules, including soaps and detergents, are added into water. When added into water, each of the molecules are attracted to one another in order to decrease the surface tension [1] [3]. Therefore, the colloidal micelles are the combination between colloid and micelles, in which to be explained briefly, they are mixture of small molecules that can suspended and dispersed in another substance.. The example of the research that is applying the disinfection type of wastewater treatment is by using the neutral pH photo-Fenton [4].

In this research, the colloid micelles that is used is AD NANO. AD NANO is the product used for this kind of wastewater treatment method. This product is produced from the AD NANO TECHNOLOGY SDN BHD and this manufacturer company has license in manufacturing the cleaning products in the field of environment. This product can be either used as the disinfectant or deodorizer and based on the research, the hotel and hospital area mainly use this kind of product [5]. The AD NANO product is also can be used for other things such as food processing and agriculture, building and facilities management, and marine and offshore [6].

In this research, the sample of the wastewater is taken at certain place which is, inside of Universiti Teknologi Mara (UiTM), Shah Alam. In UiTM Shah Alam, there are many sewage treatment plants that are operated at the different places. Each one of the sewage treatment plants are located at Chancellery, Mawar college and ROTU respectively. From these three places, Mawar college sewage treatment plant is chosen as the place for the wastewater sampling. Mawar college sewage treatment plant is chosen due to the high Biochemical Oxygen Demand (BOD5) level in the wastewater. When the BOD5 level in the wastewater is high, it means that the content of the organic matter in the wastewater is as well high too. The organic matter that lives in the wastewater required oxygen in order for them to live. So, when the BOD5 test is carried out in the wastewater, it will show high reading due to the high demand of oxygen by the organic matter.

II. METHODOLOGY

A) Wastewater Sample Preparation

The location for collecting the sewage wastewater is decided to be Mawar college sewage treatment plant. There are two methods that can be followed in collecting the wastewater sample. The two methods are grab samples and composite sample [7].

Based on these two different methods, the grab sample method is chosen since it does not spend much time and cost in conducting the procedure. The sample is supposedly collected at the discharge point of Mawar College sewage treatment plant by using the design equipment. After the sample is taken, it is then poured into the 5.5 liters' bottle. The sample is taken to the laboratory and then, it is transferred into the 6 high-polymer bottles with the volume of 500 ml for each bottle. The reason for the high-polymer bottle to be used that contain with the sample is to prevent the UV ray or light to directly travel through the wastewater.After that, the 6 bottles that contained 500 ml of sample are stored inside the fume chamber.

B) Colloid Micelles Preparation

AD NANO is the colloid micelles that is used in this reasearch. This product is available at AD NANO TECHNOLOGY SDN BHD through the DagangHalal.com website [5]. From this company, there are three products that are related to the cleaning process. The products are AD NANO 1:20 Aqueous Cleaner & Degreaser, AD NANO 1:10 Aqueous Cleaner & Degreaser, and AD NANO Multi-Purpose Cleaner & Aqueous Cleaner & Degreaser [20]. This product has already been undergo 1:10 dilution process and after this product is obtained, a dilution process is applied again towards this product by using water with the dilution factor below than 10.

C) Gas-Chromatography-Mass Spectrometry (GC-MS) Measurement

1) Liquid-Liquid Extraction (LLE)

First of all, the diluted AD NANO product is poured into the 6 high-polymer bottles in the following volume; 2 ml, 4 ml, 6 ml, 8 ml, and 10 ml. The bottles are then labelled according to the volume of AD NANO product that is poured into the bottles and the one bottle that AD NANO is no poured into it, is labelled as 'blank'. After that, the 6 bottles are shaken lightly to make sure the mixture of the sample and the diluted product are mixed well. Later, the 6 bottles are stored back in the fume chamber for a single day.

On the next day, 20 ml of the sample mixture from each bottle was taken by using the measuring cylinder and then, poured into 6 small beakers. Hexane solution is used for the next step in which, the volume of 10 ml of hexane is taken and then poured into the small beaker. The 10 ml of the hexane solution is taken for 6 times by using the measuring cylinder. After that, all the small beakers are shaken until two layers are formed in the mixture. When the two layers are visible in the small beakers, the dropper is used to extract the upper layer of the mixture, out of the small beakers. This step is repeated for the other 5 small beakers. This mixture from each small beaker is then transferred to the small tube for the next process.

This whole process is repeated for 3 days and the 6 small tubes that are contained with the mixture of sample, diluted AD NANO and hexane solution are taken for the reading of the temperature.

2) Analyses of the Sample Content

The purpose of this next step is to characterize the volatile organic compound (VOC) that is contained in the sample by using the gas-chromatography-mass-spectrometry GC-MS equipment. In (GC-MS) process, the steps are divided into chemicals and standard preparation, sample collection and thermal desorption procedures and, the identification and analysis of the (VOC) [9]. However, for this research project, the last step of the experiment is followed while the other two steps are ignored. In this last step of the GC-MS process, the identification and analysis process of the sample was conducted by using the GC-MS equipment that can be found in the laboratory at level 6, faculty of chemical engineering.

The initial temperature of this process is set up to be 50 ℃ and then, for every minute, the temperature is raised by 15℃, and the increasing temperature is carried on until reached 220℃ [8]. Other than that, with 1.8 ml/min of flow rate, the helium play the important role as the carrier gas. Based on Bei Wang et al., (2012), the mass spectrometer acquired data in scan mode with m/z interval ranging from 35 to 335. Lastly, the determination of the volatile organic compounds is performed. In this step, the VOC in the wastewater is identified by comparing the mass spectrum library that is included in the GC-MS system, between the obtained mass spectra. The purpose of this comparison method is to find the matching between them. All the data that is obtained from this experiment, is recorded immediately.

D) The Fourier Transform Infrared (FTIR) Spectrometer Measurement

The purpose of this experiment is to determine the existence of the functional group that can react to the organic matter, such as NO_2^-, NO_3^- and NH_3 compound. The first step in conducting this process is to turn on the computer that is connected to the FTIR machine. After that, the software regarding this process is opened. Then, 2 – 3 drops of the sample from the 6 bottles are taken and each of them is loaded into the sample holder of the FTIR machine. When the sample had been loaded, the software on the computer is used to run the FTIR machine. After a while, the results for each of the 6 samples are given in the form of a graph. These results are copied and then saved in the Microsoft Excel, to display the amount of the inorganic matter that exist in each sample. Other than that, to run the process on this machine, the FTIR machine is set up with the wavelength range of 4000–500 cm^{-1} [10]. This process is applied to all of the 6 samples and the data obtained from this experiment is recorded.

E) Sample Preparation for Chemical Oxygen Demand (COD) Test, Total Suspended Solid (TSS) Test and Color Test

The purpose of this method is to prepare the sample of the sewage wastewater before running the (COD) test, (TSS) test and color test.. In the beginning, the 7 vial tubes are prepared and these tubes are filled with the approximately 5 ml of COD reagent. Then, the 2 ml of the sample is taken from the high-polymer bottle that is labelled with 'blank', and loaded into the one of the vial tube. Meanwhile, the other vial tube is filled with 2 ml of distilled water, in which, act as indicator of the experiment [11]. The first test tube is labelled with '1' while the second one is labeled with '2'. This process is same for other sample in which, the 2 ml of the sample is taken from each high-polymer bottle that is labeled with '2 ml', '4 ml', '6 ml', '8 ml', and '10 ml'. The sample is then is poured into the remaining vial tubes with the label of 3, 4, 5, 6, and 7 respectively. All of the vial tubes are keep tightly close in the COD digester within 2 hours with the set temperature of 150 ℃. The COD digester is then turned off after 2 hours and all the vial tubes had been cool down to room temperature in an hour.

F) Chemical Oxygen Demand (COD) Test

The purpose of this test is to be used as an indicative measure of the amount of oxygen that can be consumed by reactions in the sample [12]. In this test, the previous step is continued in which, 7 vial tubes that are contained with the different samples were put into the portable spectrophotometer, one by one. First of all, the portable spectrophotometer was turned on and then, the vial tube with the '1' label is put into the portable spectrophotometer. After that, the 'STORED PROGRAM' was clicked and 'COD LR TEST' was chosen. The meaning of LR here is the low reagent in which, the COD reagent use is low. After that, 'CAL' was clicked to calibrate the test and then, the vial tube with '1' label was taken out from the portable spectrophotometer. As for the next step, the vial tube with '2' label was put into this machine and then, the 'READ' was clicked. After a few seconds, the result had been shown and it was recorded. All of these step was repeated by replacing the vial tube '2' with the vial tube '3', '4', '5', '6' and '7'. The result for each sample was recorded.

G) Color Test

The purpose of this test is to define the color of the samples right after the samples were taken out from the COD digester [13]. This test was conducted after the COD test was done and the step in this test is quite similar to the COD test. Right after the vial tube '1' was put into the portable spectrophotometer, the 'STORED PROGRAM' was clicked. Then, the 'COLOR TEST' was chosen for this test. After that, 'CAL' was clicked to calibrate the test and then, the vial tube with '1' label was taken out from the portable spectrophotometer. As for the next step, the vial tube with '2' label was put into this machine and then, the 'READ' was clicked to show the result. All of these step was repeated by replacing the vial tube '2' with the vial tube '3', '4', '5', '6' and '7'. The result for each sample was recorded.

H) Total Suspended Solid (TSS) Test

The purpose of this test is to define the total suspended solid that is contained in the samples right [14]. This test was conducted after the color test was done and the step in this test is quite similar to the COD test. Right after the vial tube '1' was put into the portable spectrophotometer, the 'STORED PROGRAM' was clicked. Then, the 'TSS TEST' was chosen for this test. After that, 'CAL' was clicked to calibrate the test and then, the vial tube with '1' label was taken out from the portable spectrophotometer. As for the next step, the vial tube with '2' label was put into this machine and then, the 'READ' was clicked to show the result. All of these steps was repeated by replacing the vial tube '2' with the vial tube '3', '4', '5', '6' and '7'. The result for each sample was recorded.

I) Dissolved Oxygen (DO) Test

The purpose of this test to be conducted in this research project is to define the organic matter concentration in the sample. In this test, the samples contained in the 6 high-polymer bottles are used. In the beginning of this test, 6 beakers were used and each of them was used to pour 300 ml of each samples. Then, each of the beaker was labelled with '1', '2', '3', '4', '5', and '6', which represent 0 ml, 2 ml, 4 ml, 6 ml ,8 ml, and 10 ml of AD Nano used in high polymer bottle respectively. Meanwhile, another beaker is prepared which is contained with 300 ml of distilled water [15] [16]. This beaker is labelled as '0' and it is treated as the indicator of this experiment. By using the dissolved oxygen (DO) meter, the measurement of the DO level for all 7 beakers are carried out. The reading of the DO level for each beaker is recorded.

J) Turbidity Test

The aim of this test is to define the turbidity of the sample. The turbidity of the wastewater is one of the important clue in determining the quality of the water [17]. The turbidity is the thing that is visible to our naked eyes and it is determined based on the cloudiness of the sample [18]. In the beginning, the turbidometer machine would be turned on and then, 10 ml of the 'blank' sample was poured into the vial tube. After that, the vial tube containing the sample was placed inside the turbidometer. Then, the 'READ' button was clicked on the turbidometer in order to let the machine to measure the turbidity of the sample. After a few minutes, the result would be appeared on the machine screen. The vial tube then was cleaned first before proceed to the next part. For the next part, the procedure will be the same and the 'blank' sample will be replaced by the other samples of wastewater contained in the high-polymer bottles, which is, '2 ml AD NANO', '4 ml AD NANO', '6 ml AD NANO', '8 ml AD NANO', and '10 ml AD NANO' sample. The result from each sample was recorded.

III. RESULTS AND DISCUSSION

A) Measurement of Gas-Chromatography-Mass Spectrometry (GC-MS)

Based on the graph below, it shows the amount of organic matter that contained in each sample. Even though the graph shows some unpredicted line, the amount organic matter in each sample can be defined by using the graph and report that is provided by Encik Yazid, assistant science officer of UiTM Shah Alam. **Table 1** below provide the amount of organic matter in each sample and based on the data in **Table 1**, it shows that the amount organic matter is differing for each sample except for the 'blank' sample. For the 'blank' sample, day 2 and day 3 shows that there is a change in the number of organic matter identified. From day 2 until day 3, the organic matter is believed to be reduced by 1. Based on the journal, the UVB irradiation is one of the method that able to reduce the organic matter in wastewater [19]. Therefore, it can be assumed that the missing organic is degraded due to the UV ray. In day 3, the total organic matter in '10 ml AD NANO' sample is lesser than the total organic matter in '2 ml AD NANO' sample. So, this show that volume of AD NANO used is one of the factors in this research [19]. Between day 1 to day 3, the '10 ml AD NANO' sample from day 3 show the less amount. Therefore, it can be proved that time is one of the factors in this research too, as stated in the journal [20].

➔ Result of each sample at day 1:

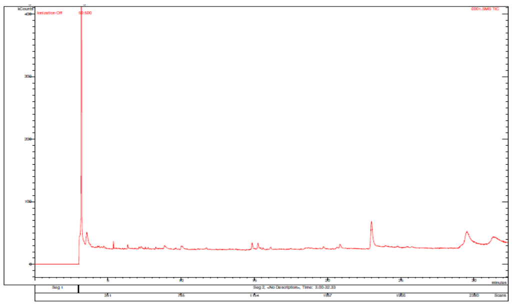

Figure 1: 'Blank' sample

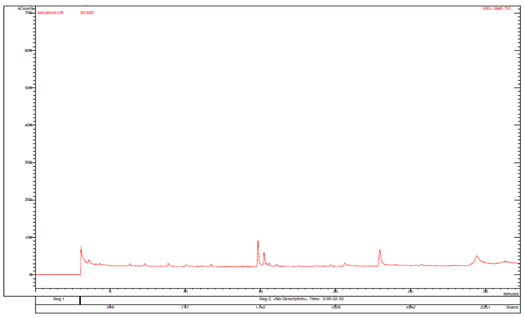

Figure 2: '2 ml AD NANO' sample

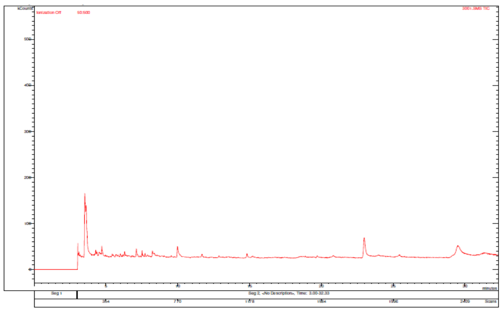

Figure 3: '4 ml AD NANO' sample

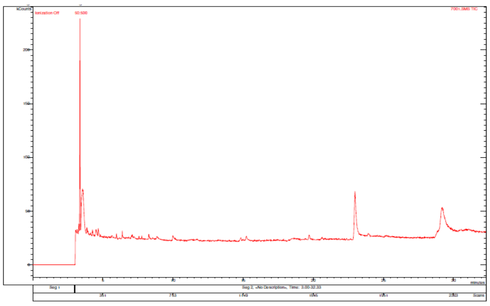

Figure 4: '6 ml AD NANO' sample

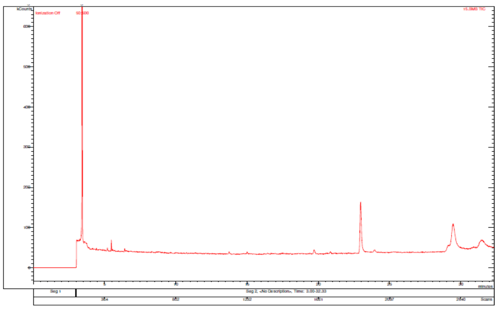

Figure 5: '8 ml AD NANO' sample

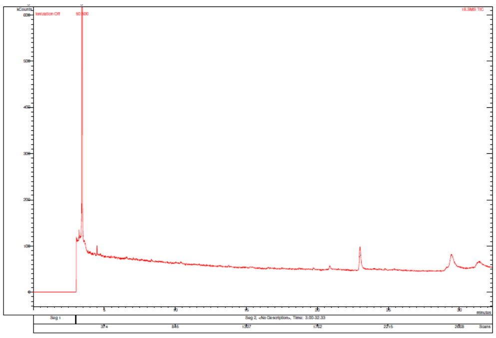

Figure 6: '10 ml AD NANO' sample

➔ Result of each sample at day 2:

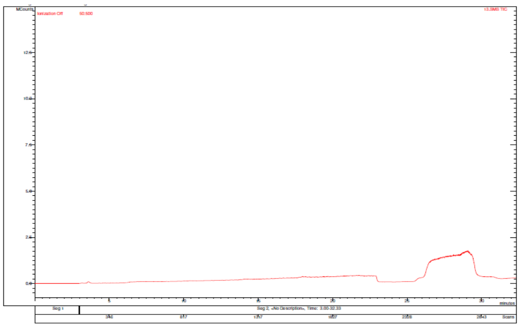

Figure 7: 'Blank' sample

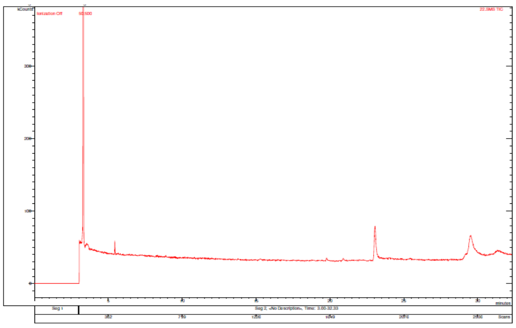

Figure 8: '2 ml AD NANO' sample

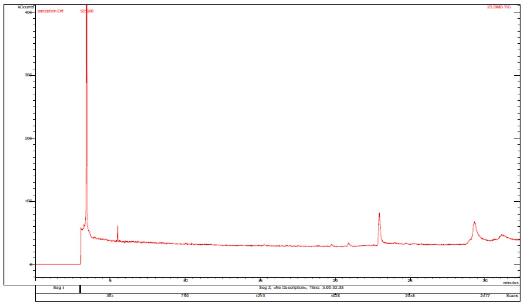

Figure 9: '4 ml AD NANO' sample

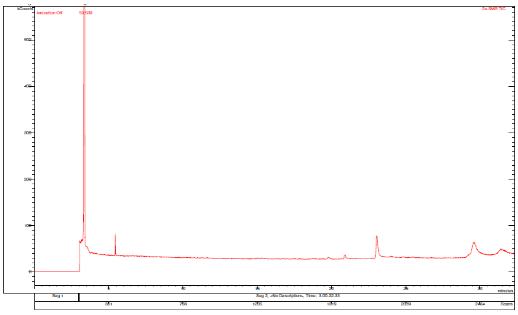

Figure 10: '6 ml AD NANO' sample

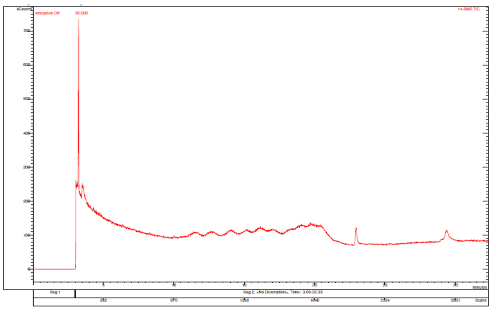

Figure 11: '8 ml AD NANO' sample

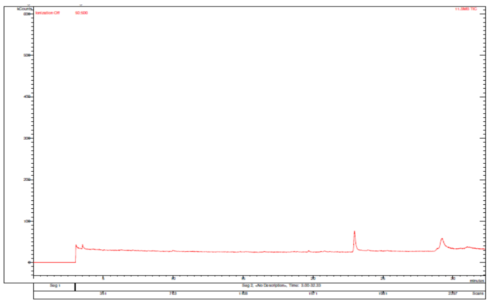

Figure 12: '10 ml AD NANO' sample

➔ Result of each sample at day 3:

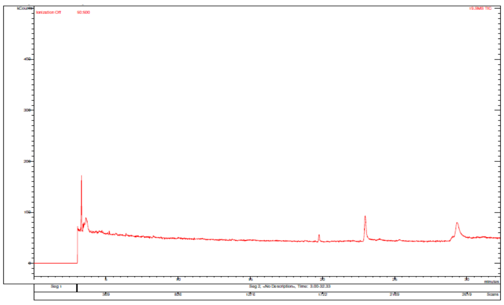

Figure 13: 'Blank' sample

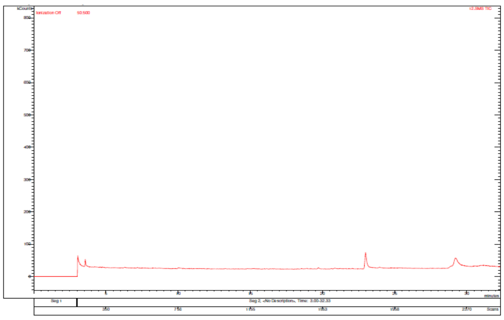

Figure 14: '2 ml AD NANO' sample

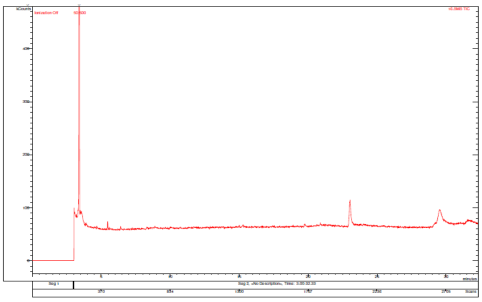

Figure 15: '4 ml AD NANO' sample

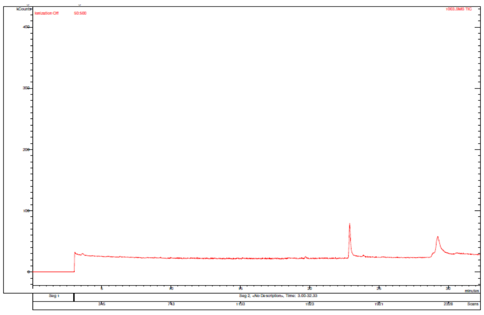

Figure 16: '6 ml AD NANO' sample

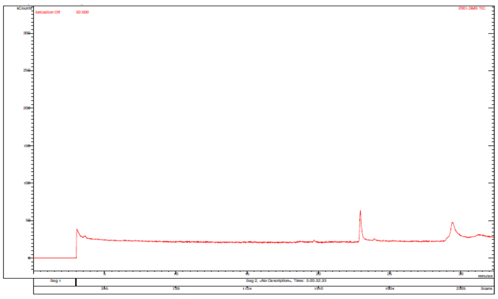

Figure 17: '8 ml AD NANO' sample

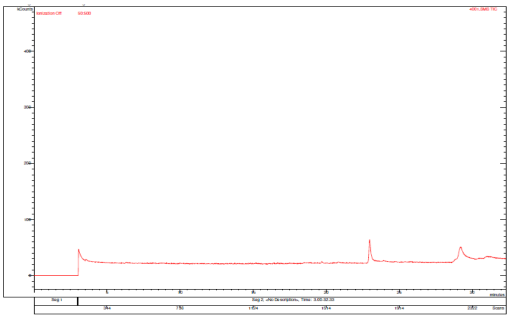

Figure 18: '10 ml AD NANO' sample

Table 1: Total organic matter in each sample from day 1 to day 4.

Day	Sample	Amount of organic matter identified
1	Blank	13
	2 ml AD NANO	14
	4 ml AD NANO	12
	6 ml AD NANO	12
	8 ml AD NANO	11
	10 ml AD NANO	11
2	Blank	13
	2 ml AD NANO	11
	4 ml AD NANO	11
	6 ml AD NANO	10
	8 ml AD NANO	10
	10 ml AD NANO	9
3	Blank	12
	2 ml AD NANO	9
	4 ml AD NANO	9
	6 ml AD NANO	8
	8 ml AD NANO	8
	10 ml AD NANO	7

B) Measurement of the Fourier Transform Infrared (FTIR) Spectrometer

By going through **Figure 19** and **Figure 20**, there are three functional groups that can be found in the sample and each of these functional group is determined by the zone, line shape and wave number [21]. So, in the sample, the only zone that involved is zone 1, zone 3 and zone 5. For zone 1, the wave number that takes place is in the range of 3700 – 3200 cm^{-1} [21]. Since the graph from all the sample show the elongation of 'U' line and the wave number from the graph is around 3260 cm^{-1}, therefore, the functional group that is believed to be exist is alcohols (O-H).

As for the zone 3, the wave number that takes place is in the range of 2300 – 2000 cm^{-1} [21]. The line from the graph of the entire sample shows quite zig-zag line in this zone. For this zone, there are two functional groups that assumed to be exist which is alkyne (C≡C) and nitrile (C≡N). The line shape for both of this functional group is almost the same but what makes them difference is the wave number. The line shape based on the journal is totally different from the graph in the result. Thus, the line shape cannot be used as the reference for this zone. However, in this experiment, the functional group that is believed to exist in this zone is alkyne since the wave number from the graph in the result is around 2130 cm^{-1}. As for zone 5, the wave number that takes place is in the range of 1680 – 1450 cm^{-1} [21]. Based on the graph, the shape line is similar to the one in the zone 1 which is, the elongation of 'U' line and the wave number shows to be existed around 1630 cm^{-1}. Therefore, the functional group that is found in the zone 5 is alkene (C=C).

Based on the journal, the graph from FTIR show the peak value for the functional group that exists in the wastewater[10]. However, this peak value is not referred in this research as it seems that the peak values among the sample are almost the same. So, this show that the FTIR measurement does not effective to be used in this experiment and this machine is used only to identify the functional groups that exist in the sample in this experiment.

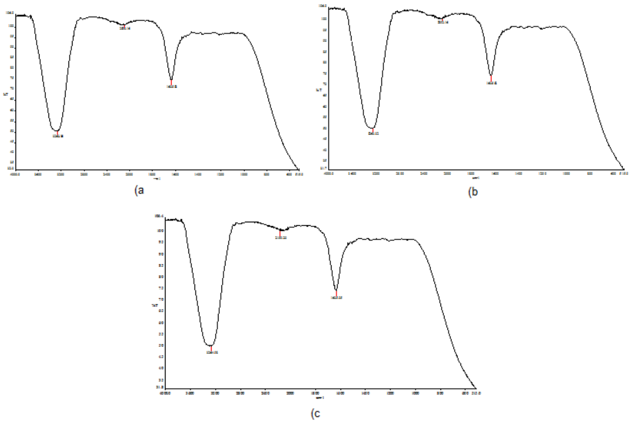

Figure 19: (a) ‘10 ml AD NANO’ sample, (b) ‘8 ml AD NANO’ sample, and (c) ‘6 ml AD NANO’ sample

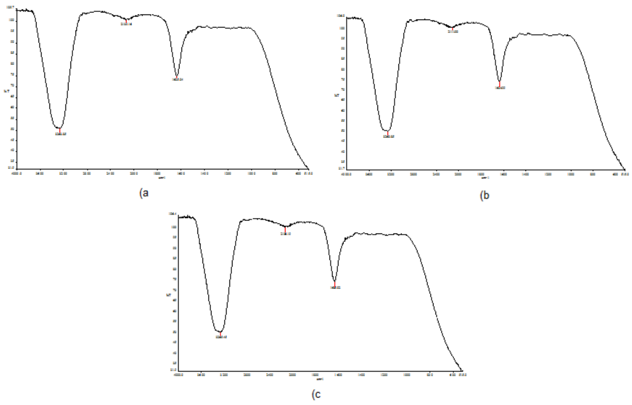

Figure 20: (a) ‘4 ml AD NANO’ sample, (b) ‘2 ml AD NANO’ sample, and (c) ‘Blank’ sample

C) COD Test

Based on the data in **Table 2**, the ‘1’ sample is used as the indicator and that is the reason for the COD reading to be zero. According to the data, the COD reading seems to be decreased from ‘blank’ (2) sample to ‘10 ml AD NANO’ (7) sample. This data also supported by the graph in **Figure 21**, which is the line seems to be dropping. Based on the journal, the result show that the $FeCl_3$ is reduced since the line of the graph for COD reading seems to be decreased [22]. So, from all of this information, it proved that the amount of organic matter in wastewater is decreased due to the used of AD NANO [15]. Other than that, the amount of AD NANO used also plays an important role. As shown on the table and graph, the 10 ml of AD NANO used show 3 mg/L of COD reading, compared to 2 ml of AD NANO used that show 48 mg/L of COD reading. This means that the amount of organic matter in ’10 ml AD NANO’ sample is less than in ‘2 ml AD NANO’ sample.

Table 2: COD reading for 7 samples

Items	COD reading (mg/L)
Distilled water (1)	0
Blank (2)	59
2 ml AD NANO (3)	48
4 ml AD NANO (4)	30
6 ml AD NANO (5)	21
8 ml AD NANO (6)	9
10 ml AD NANO (7)	3

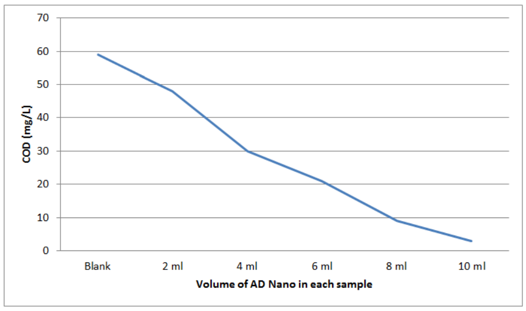

Figure 21: COD test against each sample

D) Color Test

The data in **Table 3** is the reading of the color test in the value form for each sample. According to the data, the COD reading seems to be decreased from ‘blank’ (2) sample to ‘10 ml AD NANO’ (7) sample. This data also supported by the graph in **Figure 22**, which is the line seems to be dropping. Other than that, based on the data in the **Table 3**, the color reading of the distilled water ‘1’ sample is zero while for the other sample, the color reading shows some value. As we know, the distilled water is the water that is contained with no impurities and this shows that there is no organic matter that exists in the distilled water [15]. This explained the color reading of the distilled water is zero and as for the sample, the value of the color reading shows the existence of the organic matter. So, from all of this information, it shows that the AD NANO used cause the change in color of the sample that had been reacting with the COD LR reagent. In addition, the color reading of sample contained with 10 ml AD NANO is less than the color reading of sample contained with 2 ml AD NANO. This shows that the amount of organic matter in ’10 ml AD NANO’ sample is less than in ‘2 ml AD NANO’ sample. Therefore, this means that the amount of AD NANO used also plays an important role.

Table 3: Color reading for 7 samples

Items	Color reading (ptCo)
Distilled water (1)	0
Blank (2)	38
2 ml AD NANO (3)	30
4 ml AD NANO (4)	24
6 ml AD NANO (5)	19
8 ml AD NANO (6)	12
10 ml AD NANO (7)	5

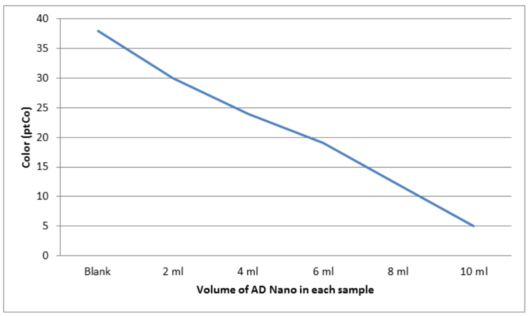

Figure 22: Color test against each sample

E) TSS Test

According to the data in **Table 4**, the TSS reading seems to be decreased from ‘blank’ (2) sample to ‘10 ml AD NANO’ (7) sample. This data also supported by the graph in **Figure 23**, which is the line seems to be dropping. As shown in the data, the TSS reading in the distilled water is zero and this means that the distilled water does not contained with organic matter [15]. Thus, the other sample that has value of the TSS reading shows to be contained with organic matter. Other than that, based on the journal, the *Escherichia coli* and *Bacillus subtilis* were reduced in the wastewater, which is determined by the decreased reading in TSS test [23]. So, from all of this information, it can be proved that the amount of organic matter in sample is decreased since the TSS reading is decreased, due to the used of AD NANO. In addition, the amount of AD NANO used also plays an important role. As shown on the **Table 4** and **Figure 23**, the 10 ml of AD NANO used show 3 mg/L of TSS reading, compared to 2 ml of AD NANO used that show 47 mg/L of TSS reading. This means that the amount of organic matter in '10 ml AD NANO' sample is less than in '2 ml AD NANO' sample.

Table 4: Color reading for 7 samples

Items	TSS reading (mg/L)
Distilled water (1)	0
Blank (2)	47
2 ml AD NANO (3)	38
4 ml AD NANO (4)	29
6 ml AD NANO (5)	21
8 ml AD NANO (6)	14
10 ml AD NANO (7)	3

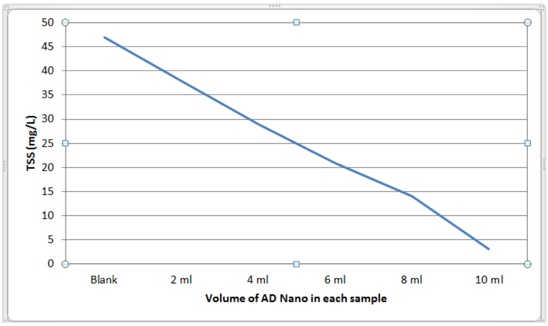

Figure 23: TSS test against each sample

F) DO Test

According to the data in the **Table 5**, the DO reading seems to be decreased from 'blank' (2) sample to '10 ml AD NANO' (7) sample. This data also supported by the graph in **Figure 24**, which is the line seems to be dropping. the DO reading determined the level of organic matter in the sample. Thus, when comparing the sample without the use of AD NANO and the one that had been used with AD NANO, the organic matter in the sample that contained with AD NANO seems to be less than the other one. In addition, the amount of AD NANO used also plays an important role. As shown on the table and graph, the 10 ml of AD NANO used show 0.1 mg/L of DO reading, compared to 2 ml of AD NANO used that show 1.8 mg/L of DO reading. This means that the amount of organic matter in '10 ml AD NANO' sample is less than in '2 ml AD NANO' sample.

Based on the journal, temperature is one of the factor that may affect the growth of the bacteria [24]. However, from the data in Table 4.4, the reading of the temperature remains unchanged throughout all the samples. So, this proved that the used of AD NANO does not affect the temperature of the sample and also, the amount of AD NANO used seems to be ineffective towards the temperature of the sample.

Table 5: DO and temperature reading for 6 samples

Items	DO (mg/L)	Temperature (℃)
Blank (1)	5.3	25.03
2 ml AD NANO (2)	1.8	25.08
4 ml AD NANO (3)	0.5	25.09
6 ml AD NANO (4)	0.3	25.12
8 ml AD NANO (5)	0.2	25.13
10 ml AD NANO (6)	0.1	25.15

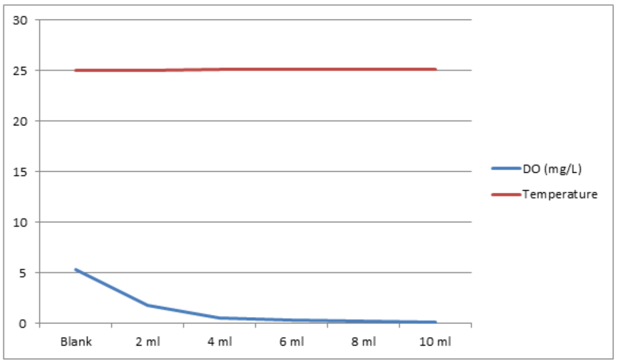

Figure 24: DO test and temperature against each sample

G) Turbidity Test

This method is conducted as followed in the journal, which is the turbidity meter is used to determine the turbidity level in the sample [22]. According to the data in the **Table 6**, the turbidity reading seems to be decreased from 'blank' (2) sample to '10 ml AD NANO' (7) sample. This data also supported by the graph in **Figure 25**, which is the line seems to be dropping. Based on the journal, the turbidity reading seems to be decreased when the wastewater treatment is applied [22]. This shows that the AD NANO had some effect in the reading of the turbidity. As an explanation, the turbidity reading determined the level of organic matter in the sample [18]. Thus, when comparing the sample without the use of AD NANO and the one that had been used with AD NANO, the organic matter in the sample that contained with AD NANO seems to be less than the other one. From the data, 10 ml of AD NANO used show 2.2 ntu of turbidity reading, compared to 2 ml of AD NANO used that show 15.5 ntu of DO reading. So, the amount of organic matter in '10 ml AD NANO' sample is less than in '2 ml AD NANO' sample.

Table 6: Turbidity reading for 6 samples

Items	Turbidity reading (ntu)
Blank (2)	15.5
2 ml AD NANO (3)	13.1
4 ml AD NANO (4)	11.0
6 ml AD NANO (5)	9.7
8 ml AD NANO (6)	4.1
10 ml AD NANO (7)	2.2

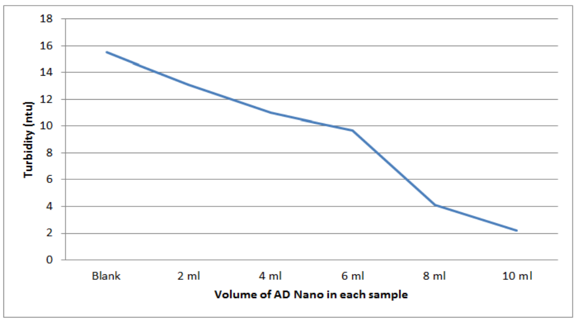

Figure 25: Turbidity test against each sample

IV. CONCLUSION

The conclusion for this project is researcher successfully achieved all the project objectives. Based on the GC-MS measurement, the amount of organic matter in the sewage wastewater seems to be high level. In order to provide best environmental option for the wastewater, the organic matter must be reduced. Other than that, the existence of functional groups in the sewage wastewater that had been identify by using the FTIR measurement, must be reduced too Therefore, the colloid micelles, AD NANO is used and based on the GC-MS measurement, COD test, color test, TSS test, DO test and turbidity test, the amount of organic matter in the wastewater is proved to be reduced.

There are many factor that affect wastewater treatment. The solution strength one of the factor that is determined by the volume of AD NANO used. As shown by the result from one of the method, COD test, it is proven that the higher the volume of AD NANO used, the more organic matter in the sewage wastewater will be reduced. For the second factor, time is determined by the experiment conducted in GC-MS. The sample from this experiment is taken for each day and based on the result, the longer the time, the more organic matter in the wastewater will be reduced. The temperature factor is determined by the result from the DO test, Based on the result, it shows that the temperature remain unchanged although the volume of AD NANO used for each sample is difference. Thus, this shows that the temperature is unaffected by the use of AD NANO. As for the mechanical issue, this factor is the error that arises during the experiment that may affect the result. Fortunately, there is no error that occurred during the experiment and the result obtained shows the experiment to be a success.

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