Effectiveness of Utilization Kerang Dara Shell’s (Andara Granosa) As A Coagulants in Industrial Waste Water Treatment Processing

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Abstract. Andara granosa shell is one of the bivalves that is found in Indonesia. The high level of andara granosa is meat consumption without being followed by right processing of the shells, makes andara granosa shells become a waste that disrupts the environment. Andara granosa is contain a lot of CaCO3. Andara granosa shells contain a lot of CaCO3 which makes it can be used as a coagulant. Shells containing CaCO3 are converted into CaO (Calcite) first by the process of calcination. In this study, calcite was obtained through the process of calcining of andara granosa shells at 800 °C for 4 hours, which was dried and destructed before. The calcite optimization test in andara granosa is done by analyzing the ratio of calcite concentration variation (600 ppm, 700 ppm, 800 ppm, 900 ppm, 1000 ppm) to the decrease in BOD, COD, and TSS values in industrial liquid waste. The test results show the optimal optimal decrease in BOD, COD, and TSS values is at a concentration of 900 ppm with an effectiveness of 80.53%. The relationship between the concentration of coagulant to decrease in BOD value is shown by the equation y = -6.7043x² - 50.275x + 599.83 and R² = 0.9356, % effectiveness of COD 81.16%. The relationship between the concentration of coagulant to decrease in COD value is shown by the equation y = -4.3214x² - 130.15x + 1033.4 and R² = 0.9492, % effectiveness of TSS 96.10%. The relationship between coagulant concentrations and the decrease in TSS values is shown by the equation y = 32.611x² - 304.24x + 697.95 and R² = 0.9088. Thus calcite with raw material of blood shells can reduce the optimal BOD, COD, and TSS values at a concentration of 900ppm.

Keywords: Andara granosa shells, calcite, coagulant, concentration.

1. Introduction

Blood shells (Anadara granosa) are a popular type of shell in Indonesia. So many of blood shells (Anadara granosa) in Indonesia according to the West Java Province Fisheries and Maritime Service (2014)[1], The West Java Province produced as many as 34,388,500kg shells during 2014. Utilization waste of blood clam shells is still a bit such as raw materials of souvenir, making whiting, making toothpaste and also as a water purifier. Industrial wastewater treatment can be done by the process of coagulation and flocculation through the use of shells as a coagulant. Coagulants are chemicals that have the ability to neutralize colloidal charges and bind the particles so that they easily form flocks or lumps [2].

The main mineral content in shells is mostly CaCO3. The shells contain calcium carbonate (CaCO3...
can be used as water separation of metal ions contained in Coagulants. Shells containing CaCO3 are converted into CaO first by the process of calcination [3]. Calcium oxide is a material that is soluble in water and produces hydroxyl groups, namely Ca(OH)2 which is alkaline. Calcium oxide can be useful as a material for reducing hardness, neutralizing acidity, reducing the levels of silica, manganese, fluoride and organic materials. In addition, it can also reduce levels of Biological Oxygen Demand (BOD) by absorbing between 40% to 50% dissolved and non-dissolved organic matter [3].

In this study, blood shell waste will be used as a coagulant in PT. Mane Indonesia. PT. Mane Indonesia has a COD content of 860mg / l, BOD of 516mg / l, and a TSS of 476.36mg / l that exceeds the industrial standard quality standard where the standard for COD is 400mg / l, BOD is 200mg / l and TSS is 400mg / l. Therefore, research will be carried out on the utilization of blood shells as a coagulant to determine the effectiveness of the decline in the value of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Suspended Solids (TSS) of industrial wastewater from PT. Mane Indonesia.

2. Methodology

The raw material used in this study is a blood clam shell (Andara Granosa). Andara granosa shells contain a lot of CaCO3 so that it can be used as a coagulant. Shells containing CaCO3 are converted into CaO (Calcite) first by the calcination process. In this study, calcite was obtained through the process of calcining the red shells at 800 °C for 4 hours, after which the granosa had been dried and crushed. Andara calcite optimization test for granosa was carried out by analyzing the comparison of calcite concentration variation (600 ppm, 700 ppm, 800 ppm, 900 ppm, 1000 ppm) to the decrease in BOD, COD, and TSS values in industrial liquid waste. Primary data collection is carried out at PT. Mane Indonesia, the data obtained is then processed based on existing references. Secondary data collection was obtained from third parties with the method of analysis in the form of a jar test method used is SNI 19-6449-2000, the method for measuring pH used is the APHA 4500H+2012 method, the method for measuring TSS used is the APHA 2540 D 2012 method, the method for measuring COD used is the SNI 6989.2: 2009 method. [4]

3. Results And Discussion

The following are the results of the test parameters that have been carried out in the study. BOD Analysis Results;

![Fig. 1. Effect of Calcite Addition on Decreasing BOD.](image)

Based on Figure 1, the addition of shell ash concentration makes BOD values to decrease starting at the addition (600-900) mg of shell ash. Variation of coagulant mass to wastewater decreases with increasing coagulant mass, so the BOD value decreases at the optimum concentration. This is consistent with what was stated by Surest (2012)[5], that the addition of shell ash (CaO) reacts with water (H2O) and forms Ca(OH)2 so that oxygen levels decline. Variation of coagulant mass to wastewater has decreased with increasing coagulant mass, the BOD value has decreased. This can be
caused by the high or low content of organic matter in processed water on the performance of the coagulant ability of calcium oxide blood shells (Anadara granosa) which results in decreased levels of dissolved oxygen in water, because it is used for the oxidation process of organic matter. COD Analysis Results.

![Fig. 2. Effect of calcite addition to COD reduction.](image)

The addition of calcite concentration causes the COD value to decrease starting from the addition of 600-900mg of calcite, this is because calcite functions as a coagulant and adsorbent that is binding to molecules found in water. This is consistent with what was stated by Aziz (2013)[6] that the ability of the calcium oxide coagulant from the shell of a blood clam (Anadara granosa) can only oxidize the material. The addition of calcium oxide tends to reduce the value of COD, this is due to oxidizing agents that oxidize organic matter in the water. TSS analysis result.

![Fig. 3. Effects of Calcite Addition on TSS Decrease.](image)

The addition of calcite caused TSS levels (suspended solids) to decrease from 476.36ppm to 18.57ppm on addition (600-900) mg of shell ash. However, on the addition of 1000 mg of calcite an increase in TSS was 18.8ppm. Total suspended solid (TSS) is a flock that is formed due to the movement of negative charge from colloids causing turbidity of water with a positive field of coagulant ash shells. From the graph, the TSS value is influenced by the addition of shell ash. The greater the concentration of calcite added, the more positive charge is produced, the more flock is formed. This is consistent with that expressed by the surest (2012)[5], that a growing number of cations of coagulant produced the more the colloidal particles in process water, neutralized and form a floc that TSS value will be increased, the number of TSS formed smaller. This is caused by the process of excessive cation adsorption by colloidal particles in water, causing deflection or restabilization of colloids again. The suspended solid is directly proportional to the turbidity. The smaller the TSS, the smaller the turbidity of the water.
4. Conclusions

Effectiveness of decreasing BOD value is 80.53 %, the relationship between coagulant concentration and decreasing BOD value is shown by the equation \( y = -6.7043x^2 -50.275x + 599.83 \) and \( R^2 = 0.9356 \),% effectiveness of COD 8 1.16 %, relationship between Coagulant concentration to decrease COD value shown by the equation \( y = -4.3214x^2 -130.15x + 1033.4 \) and \( R^2 = 0.9492 \),% effectiveness of TSS 96.10 %, the relationship between coagulant concentration to decrease TSS value is indicated by the equation \( y = 32.611x^2 -304.24x + \) and \( R^2 = 0.9088 \), so the ash concentration of blood clam shells as a coagulant have ability reduction of BOD, COD and TSS optimal is at a concentration of 900ppm.

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