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CHITOSAN FROM *MYTILUS VIRDIS LINNEAUS* SHELL AS A NATURAL COAGULANT

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Abstract : Green mussels (*Mytilus viridis linnaeus*) shell is one of the marine resources that can be used as raw material chitosan. Coagulant can remove turbidity through coagulation and flocculation process using coagulant. Biopolymers from natural coagulant safer and environmentally friendly so can substitute synthetic coagulant. The use of chitosan as a coagulant in this study used synthetic turbid water using distilled water, suspended solids representing kaolin and humic acids which represents organic matter. Chitosan was used with variations in pH and coagulant dosage. Chitosan remove turbidity optimum at pH 7 at a dose of 300 mg/L of 95.15%.

Keywords: *Mytilus viridis linnaeus*; Chitosan; Coagulant; Coagulation; Turbidity Removal

1. Introduction

Coagulant is very important in the coagulation-flocculation process due to charge neutralization and binding colloidal particles so that they can form a flock [1]. Commonly coagulant used in water treatment to destabilize the colloidal particles [2].

The use of synthetic coagulant has an impact on the health that residual aluminum-containing inorganic compounds are carcinogenic [3]. This is the basis of the researchers focused on the use of natural coagulants. Special quality chitosan as a coagulant is non-toxic, biodegradable, and easily interact with other organic substances such as proteins.

The overall weight of the green mussel (meat and shells) meat contains approximately 30% and generated a fairly abundant mussel shell [4]. One use of green mussel shells that can be done is to make chitosan as a coagulant in water treatment with coagulation process.

The main aim coagulation process is to destabilize so that the particles can be fuse with other particles to form larger aggregates which will be easier to settle and more easily set aside in the filtration process [5].

2. Materials and Methods

2.1 Materials

Chitosan extracted by Knorr method [6] with some modifications [7]. Chitosan used has a molecular mass of 2246.68 g/mole and a degree of deacetylation of 77.80%.

2.2 Preparation of Synthetic Water

Chitosan as a coagulant using synthetic turbid water to avoid difficulties due to the variation of natural raw water quality. Synthetic water using distilled water, kaolin as much as 100 mg /L which represents the suspended solids and humic acid 300 mg /L represents the organic material. Once mixed, stirred and allowed to stand for 24 hours.

2.3 Application of Chitosan as a Coagulant

Dissolving chitosan made reference to Danwanichakul method [8], as many as 1 g of chitosan was dissolved in 100 ml of 1% acetic acid (v/v) to obtain 10 mg of chitosan in 1 ml of solution (1% w/v).

This research conducted in laboratory scale batch process using jar test at room temperature. Jar test use Flocculation SW1 (Stuart Scientific), with 500 mL of synthetic water. Stirring rapid at 100 rpm for 1 min after the addition of coagulant, followed by slow mixing at 60 rpm for 10 minutes. After the flocculation process is complete, which has formed flock allowed settle for 30 minutes. Jar test performed with three variations of pH 5.7, and 9. For adjustment of pH using HCl 0.1M and NaOH 0.1M. The variation of coagulant dosage is 200, 250, 300, 350, and 400 mg /L.

3. Results and Discussion

Turbidity is an important parameter to be analyzed because it is a parameter that can be clearly seen. Increasingly clear water processing results (percent of processing close to 100%) means the better the results processing. In addition, turbidity removal aims to analyze the capabilities and effectiveness of chitosan used in destabilizing colloidal.

Figure1. Turbidity Removal using Chitosan

Turbidity is an important parameter to be analyzed because it is a parameter that can be clearly seen. Increasingly water treatment processing results (percent of processing close to 100%) means the better results processing. The Fig 1. shown that turbidity removal using chitosan was increased with chitosan dosage. The results was obtained optimum at pH 7, chitosan dose 300 mg/L and turbidity removal efficiency 95.15%.

Variations of coagulant dose affect for turbidity removal where the experiments were carried out, showing the level of turbidity removal increased with increasing dose of coagulant chitosan. However, excessive addition of coagulant doses showed turbidity removal efficiency does not vary much even decreasing, this is due to the failure of the formation of flock. So it will decline again because of saturation due to the addition of coagulant dose.

Chitosan is a cationic polyelectrolyte and a long-chain polymer, has a large molecular mass and reactive because of the amine and hydroxyl groups which act as electron donors. Therefore these characteristics, chitosan interacts with the colloidal particles contained in the water through the bridge between flock particles (coagulation) [9][10]. To simplify the process of coagulation, the chitosan dissolved using acid to obtain a solution of chitosan. The mechanism was based on the properties of the chitosan-containing amine group which reacts with the acid when it will form a salt. Therefore it must be dissolved into the acidic chitosan.

Molecular mass effect on the ability of chitosan as a coagulant. Molecular mass is proportional to the number of monomers in each polymer molecule, making it more effective in bridging the colloid in the coagulation process. Chitosan which a high molecular mass indicates that the polymer has a longer chain and a larger surface area, thus increasing the intensity of collision with colloidal particles [11].

The degree of deacetylation of chitosan indicates purity and possibility of use of chitosan as a coagulant. The ability of chitosan to form a flock coagulation-flocculation process is influenced by the degree of deacetylation of chitosan during preparation [12].

4. Conclusions

Chitosan from *Mytilus viridis linnaeus* shell can be used as a coagulant to remove turbidity in coagulation and flocculation process because it has a large molecular mass and a high degree of deacetylation.

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