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ABSORPTION OF COPPER (Cu) METAL SOURCE USING ZEOLITE ADSORBENT ON INDUSTRIAL WATER WASTE AT PT FERTILIZER ISKANDAR MUDA

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ABSTRACT

This study aims to examine the effectiveness of copper (Cu) metal absorption contained in Industrial Wastewater using Zeolite Adsorbent. It is known that the parameters contained in Industrial Wastewater are more dominant to heavy metals where these contents are hazardous/toxicity in the event of pollution to the environment. The tool used for the absorption of copper (Cu) content is an adsorption tool with Zeolite adsorbent with a circulation time of 20, 25, 30, 35 and 40 minutes with an adsorbent size of 60/80 and 80/100 mesh which after the adsorption process is carried out will produce Absorbance Data of Cu Product Samples and Cu Concentration Decrease Data after the Adsorption process. To analyze the sample using Atomic Absorption Spectrophotometry where the sample will be tested which will produce Adsorption data results of Copper (Cu) concentration in Industrial Wastewater, namely 0.8579 ppm or 7.7%, 0.7192 ppm or 21.6%, 0.6073 ppm or 32, 8%, 0.4769 ppm or 45.8%, 0.4260 ppm or 50.9% at 60/80 mesh and 0.1523 ppm or 78.3%, 0.1329 ppm or 80.2%, 0.1162 ppm or 81.9%, 0.1116 ppm or 82.4%, 0.0616 ppm or 87.4% at 80/100 mesh and Contact Time Graph Data of Copper (Cu) Concentration Decrease.

Keywords: Adsorption, Adsroben, Zeolite, Copper (Cu) and Atomic Absorption Spectrophotometry (AAS).

INTRODUCTION

Industrial wastewater that is polluted into the water generally has a negative effect on the environment, both organisms and humans around it, especially if the waste contains heavy metals. Metals are natural elements that can be obtained from the sea, rock erosion, volcanic mines and others. Heavy metals are included in the

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pollutant group, this is due to the properties of heavy metals that do not decompose and are easily absorbed and have harmful properties.

Some of the toxic heavy metals are As, Cd, Cr, Pb, Hg, Ni, Cu and Zn. Metals will be harmful if a certain amount of metal pollutes the environment. Certain metals will be harmful if found in high concentrations in the environment. This is because these metals have damaging properties to the body of living things.

Water turbidity is generally caused by the presence of suspended particles such as clay, mud, dissolved organic matter, bacteria, plankton and other organisms. The high value of turbidity can also complicate filtering efforts and reduce the effectiveness of disinfection in the water purification process. Several ways of processing industrial waste have been carried out, including chemically using coagulants, physically by asdorpsi using zeolites.

Zeolite is one of the alternative adsorbents that has a high adsorption ability due to the large number of pores and has a high cation exchange ability. Zeolite can be used in a wide temperature range so it is very appropriate to be used as an adsorbent (Panayotova, 2001). According to Shavandi (2012), zeolites are naturally occurring crystals, which have a three-dimensional structure. Zeolites consist of SiO4 and AlO4 tetrahedral with a very regular shape through the division of Oxygen atoms and form a honeycomb-like structure (Shavandi etal., 2012).

The utilization of zeolite as an adsorbent has been widely reported. Research by Hendrawan (2010) and Renni (2018) mentioned that natural zeolite can be used as an adsorbent for Fe3+ metal ions (Hendrawan, 2010; Renni et al., 2018). Zeolite is one of the natural minerals found in Indonesia (Marsidi, 2001). There are several types of zeolites, namely synthetic, natural, and modified. According to Senda (2006), synthetic zeolites have indeed been widely produced, but natural zeolites still have abundant availability in nature, especially in Indonesia (Senda etal., 2006). Indonesia has as much as 400 million tons of zeolite, and is exported in raw form.

In this study, the adsorption process of copper (Cu) metal will be carried out using zeolite as an adsorbent in the industrial wastewater of PT Pupuk Iskandar Muda located on Jl Medan - Banda Aceh, Tambon Baroh Village / Sub-district, Dewantara District, North Aceh, Aceh Province. The problems that can be formulated from this research include: What is the effect of contact time and adsorbent size on the concentration of copper metal (Cu) during the adsorption process. What is the efficiency value of copper metal (Cu) absorption using Zeolite adsorbent.

METHOD

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1. Tools And Material

The equipment used in this study includes Atomic Absorption Spectrophotometry, metal containers, an oven, a furnace, a spatula, glass beakers with capacities of 500 ml and 1000 ml, a 1000 ml volumetric flask, a 100 ml measuring cylinder, glass bottles, an analytical balance, a 25 ml volumetric pipette, a ball pipette, a grinding mill, a stopwatch, and pH paper. The materials used consist of 1N H_2SO_4 solution, industrial wastewater, zeolite, distilled water, and RO water.

2. Work Procedures

Work procedures study This consists of from :

- Refining , Sieving and Weeding process Zeolite ;
- Making process Solution and Activation ;
- Adsorption Process ; and
- Sample Analysis Process.

3. Refining , Grinding and Sieving Process Zeolite

a. Refining process

Zeolite refined use grinding mill tool as much as 1,200 gr

b. Sieving process

Zeolite that has been go through the refining process then sifted in accordance size adsorbent in variable free namely 60/80 and 80/100 mesh. For One mesh size of 600 gr.

c. The process of consecration

Zeolite that has been go through the screening process entered into the furnace and heated for 2 hours with temperature 300ºC for lower water content in zeolite , then chill with air free until temperature return to temperature room .

4. Manufacturing Process Solution and Activation

- Manufacturing H2SO41N solution

Pumpkin filling measure 1,000 ml with aquades ± 250 ml then add solution sour sulfate concentrated as much as 28.76 ml (1N concentration) slowly Then add distilled water until sign limit .

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- Activation process Zeolite

Zeolite entered into the glass chemistry , next insert H2SO41N solution into glass chemistry that has been filled zeolite until zeolite wet perfect Then Wait for 1 hour, then do washing zeolite with RO water until pH changed become neutral and rinse use distilled water , then bake for 2 hours until zeolite dry return .

5. Adsorption Process

Open column adsorption , enter zeolite until smooth and close return column said , then enter waste water industry into the tank , adjust the valve with right , turn it on pump with rate flow constant , take sample in accordance time circulation .

6. Sample Analysis Process

Take a sample of waste water Industry 0 as solution without adsorption process or sample beginning , enter sample to the place testing sample , do the analysis process use Atomic Absorption Spectrophotometry (AAS) unit tool , take Wastewater sample Industry next one that uses adsorbent Zeolite and do with the same way .

RESULTS AND DISCUSSION

Research This use zeolite as Adsorbent For absorb metal Copper (Cu) in Wastewater PT Pupuk Iskandar Muda Industry . Adsorbents that have been formed a number of size adsorbent in accordance variable free namely 60/80 and 80/100 mesh which are flowed with Waste Water Industry with rate flow of 3.5 l/m is ongoing for 20, 25, 30, 35 and 40 minutes . The sample will be taken in accordance time circulation in variables free the For tested Concentration of Copper Metal (Cu) using Atomic *Absorption Spectrophotometry* .

Table 1 Adsorption data results concentration Copper (Cu) in Wastewater Industry

No.	Contact Time (minute)	Size Adsorbent (mesh)	Concentration Copper (Cu) (ppm)	Decrease Concentration Copper (Cu) (ppm)	Percentage Absorption (%)	Turnaround Time
1	20	60/80	0.9356	0.8579	7.7	70 minutes / round (2 rounds)
2	25			0.7192	21.6	
3	30			0.6073	32.8	
4	35			0.4769	45.8	
5	40			0.4260	50.9	

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No.	Contact Time (minute)	Size Adsorbent (mesh)	Concentration Copper (Cu) (ppm)	Decrease Concentration Copper (Cu) (ppm)	Percentage Absorption (%)	Turnaround Time
1	20	80/100	0.9356	0.1523	78.3	90 minutes / round (1 round)
2	25			0.1329	80.2	
3	30			0.1162	81.9	
4	35			0.1116	82.4	
5	40			0.0616	87.4	

From Table 1 Results of Absorption Data Copper Cu uses Adsorbent Zeolite can We Look that after through the adsorption process mark concentration Copper (Cu) occurs reduction in Wastewater Industry , things This because of adsorbent zeolite functioning with Good in the process of absorption .

Discussion

Adsorption is an absorption process substance , can in the form of gas or liquid absorbed on the surface or wall outside Adsorbent . Adsorption process show that Because existence reaction chemistry and physics , molecules will leave solution and stick to the surface adsorbent . Adsorption process depends on the nature adsorbed molecules , properties substance solids that adsorb , concentration , temperature and others.

Zeolite is compound substance chemistry alumino-silicate hydrated with sodium, potassium and barium cations . Zeolite have a number of characteristic among others, namely easy release water due to warming up , but also easy tie return water molecules in air moist . before zeolite natural used as adsorbent , then activation process required zeolite . Stages activation zeolite natural done with method activation chemistry with method addition sour to in zeolite . Activation zeolite with addition sour can clean the dirt that closes pores in zeolite . In this case This use sour sulfate (H_2SO_4) as activation from adsorbent zeolite .

Study This use zeolite as adsorbent that absorbs metal Copper (Cu) in Wastewater Industry of PT Pupuk Iskandar Muda. Reading concentration Copper (Cu) using *Atomic Absorption Spectrophotometry (AAS)* equipment .

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Effect of Contact Time on Decrease Concentration Copper (Cu)

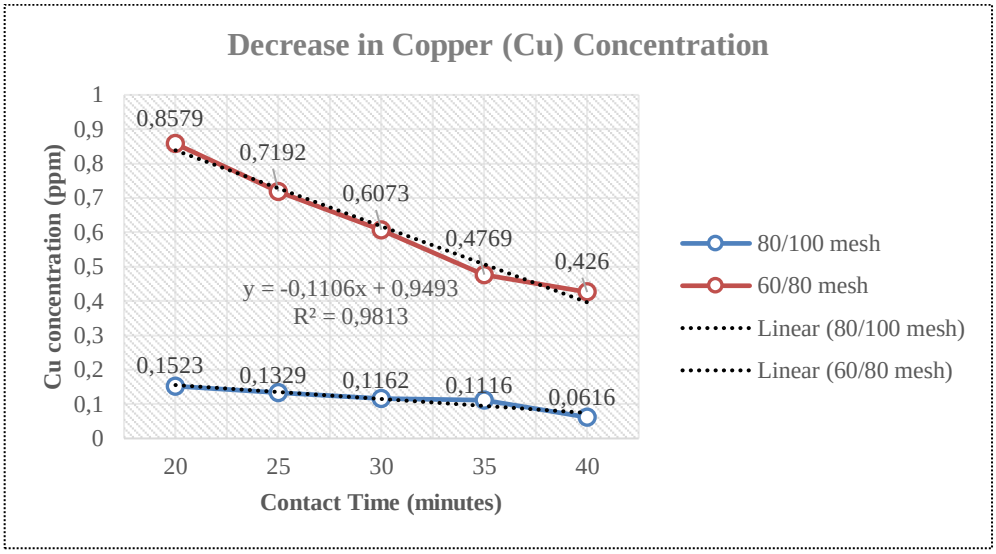

Figure 1 Contact Time Graph Data Decrease Concentration Copper (Cu)

Can seen from Figure 4.1 Contact Time Graph Data Decrease Concentration Copper (Cu) that with time contact in accordance variable free namely 20, 25, 30, 35 and 40 minutes and with size adsorbent in accordance variable free namely 60/80 and 80/100, that the occurrence decline concentration from Good Copper (Cu) with use zeolite that has been activated with H_2SO_4 as the adsorbent .

In accordance time circulation absorption best obtained at 40 minutes and size the adsorbent namely 80/100 mesh with concentration decline to 0.0616 ppm or 87.4% percentage absorption from sample wastewater start industry which is 0.9356 ppm.

CONCLUSION

From the results research that has been done , obtained conclusion among others:

- Wastewater Data Industry own concentration 0.9356 ppm.
- Adsorption data results concentration Copper (Cu) in Wastewater Industry namely 0.8579 ppm or 7.7%, 0.7192 ppm or 21.6%, 0.6073 ppm or 32.8%, 0.4769 ppm or 45.8%, 0.4260 ppm or 50.9% at 60/80 mesh and 0.1523 ppm or 78.3%, 0.1329 ppm or 80.2%, 0.1162 ppm or 81.9%, 0.1116 ppm or 82.4%, 0.0616 ppm or 87.4% at 80/100 mesh.
- Adsorption results best occurred at 40 minutes .
- Size Adsorbent best average for absorption namely 80/100 mesh.
- The more tall size adsorbent percentage results absorption obtained more tall .

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