

The Ability of Natural Zeolite Toraja South Sulawesi as Absorbent Heavy Metal Copper (Cu)

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ABSTRACT—*The purpose of research is how the characterization of natural zeolite South Sulawesi and how the ability of zeolite as filter media and adsorbents to reduce heavy metals Copper (Cu) in the raw water. XRay and zeolite characterized by SEM, Zeolite cleaned washed with distilled water, dried in the open air and then activated by heating variations; 100 °C, 200 °C, 300 °C, and 400 °C. Subsequently smoothed with a 170 mesh size (3 mm), weighed weighing 50 grams, and then incorporated into the model water treatment, then test zeolite as filter media and adsorbents. Raw water injected with 5 ppm Cu is introduced into the model and then water treatment. Water test results obtained by means of AAS decrease in the concentration of each; -0.2541; -0.2902; 0.4273 and 1.4489. Model analysis is the method of Langmuir and Freudlich. Results are expected to provide new information about the characteristics of natural zeolite South Sulawesi as well as water treatment cheap models.*

Keywords— zeolite South Sulawesi, water treatment model, heavy metal copper (Cu), raw water

1. INTRODUCTION

Pollution of the aquatic environment, resulting in water consumed for everyday purposes no longer in accordance with the designation [1]. Mostly, water/drinking water used by urban households do not meet health requirements, even in some places is not suitable for drinking. The water, containing toxic substances that are harmful [2]. If the heavy metal accumulates in the human body to a certain amount and passed the standards allowed, can cause various health problems. Example; heavy metals Mercury (Hg), mercury compounds are highly toxic to humans. The salts of mercury absorbed in the intestine and accumulates in the kidneys and liver. Levels of mercury in drinking water should not exceed 0,002 mg/liter [3].

The binding of toxic substances and heavy metals contained in the raw water, need a means of processing equipment and materials are expensive. However, in Hamlet and Hamlet in the Village Sangkaropi Kasinggiran Sangkaropi, Toao and Mendilla District of Sa 'dang Balusu Toraja regency in North and South Sulawesi Luwu, discovered the mineral zeolite, a natural ion exchangers are cheap and easily available. The ability of zeolites by many researchers, used as a versatile mineral that includes; as adsorbent andmolecular sieves, as well as a catalyst and ion exchanger [4].

To reduce the toxic materials contained in the raw water, adsorption and filtration method is an alternative method used in this treatment. The processed water is expected to meet quality requirements, in accordance with the Regulation of the Minister of Health of the Republic of Indonesia.

2. RESEARCH METHOD

Natural zeolite has an absorbent character which can absorb metal ion minerals that are contained in raw water [5]. Furthermore Sinle (2007) suggested that commonly zeolite molecule formula is $Mx/ [(AlO_2) x (SiO_2)y] m H_2O$. Zeolite utilization for various applications especially was directed to increasing effectiveness and efficiency of industrial aspect as well as its environment pollution process.

Laboratory experiments to test the model with the raw water treatment Natural zeolite South Sulawesi and absorbent natural metallic copper. This model consists of pieces of tubing that will. The procedure works is as follows:

- Reservoir filled with 8 liters of water that has been injected with a heavy metal as much as 5 ppm Copper (Cu).
- As a single media filter filled with zeolite sample weighing 50 ounces for the third tube on models with a variety of heating, respectively; 100°C; 200°C; 300°C; 400°C, then the water flowed into the model.

- Counted start time contact to produce 1 liter of clean water.
- Processed water was tested by means of AAS (Atomic Absorption Spectrophotometer) Type Shimadzu AA-7000 so that the absorbance values obtained results and the actual concentration decreased.

Laboratory experiments to examine the ability of zeolites to absorb heavy metal content in the water is performed by using a Water Treatment models consist of 4 (four) pieces of tubing that will be filled by water with water which injected with 5 ppm heavy metals copper (Cu) in Fig. 1.

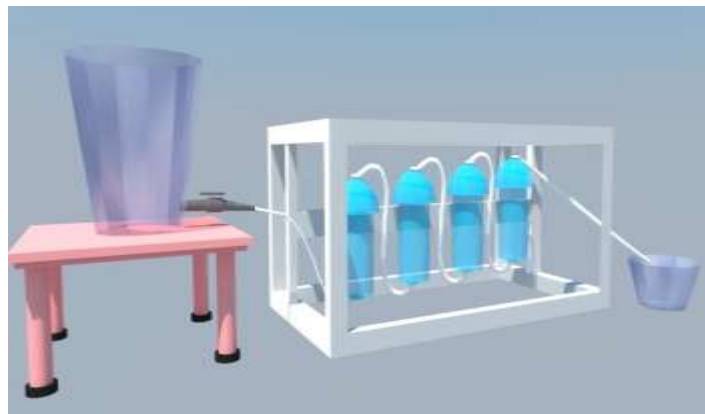


Figure 1: Water treatment models

The research activities include several stages, namely, test samples of raw water, the physical, chemical, and biological tests. Then zeolite is activated (cleaned). Furthermore, the test of water quality processing model with filter media South Sulawesi natural Zeolite is performed. At this stage the preparation and collecting observational material is performed such as raw water sampling, Natural Zeolite sampling in North Toraja Regency, then laboratory equipment is prepared.

Before the raw water is treated with zeolite, earlier laboratory test is conducted to determine the quality of the raw water to be treated.

3. RESULT AND DISCUSSION

3.1 Raw water sample

This research is using water samples from three locations namely: the water of the Jeneberang River. Laboratory examination is conducted to examine heavy metal contain level. The laboratory experiments using pure water has been given by additional content of heavy metals such Cu (Copper).

3.2 Characterizations

Zeolite samples are characterized by XRay Diffraction type Rigaku Miniflex II and Scanning Electron Microscope – Energy Dispersive Spectroscopy (SEM-EDX) type TESCAN 3 VEGA (Fig. 2 and Fig. 3). Activation zeolite is conducted with: Activation by heating (T); 100^o C, 200^o C, 300^o C, and 400^o C. Processing samples of raw water with zeolite filter media (Table 1,2,3 and 4).

Table 1. Activation by Heating 100^o C Zeolite 100^o C

Variations Activation	Concentration Actual	Time Reduction(dt)
100 ^o C	-0,2541	180
200 ^o C	-0,2902	180
300 ^o C	0,4273	180
400 ^o C	1,4489	180

Table 2. Activation by Heating 200^o C Zeolite 200^oC

Phase name	Content(%)
Quartz, syn	90(30)
Potassium Chloride	3.9(12)
Zeolite P, (Na)	5.7(18)

Table 3. Activation by Heating 300^o C Zeolite 300^oC

Phase name	content(%)
quartz low HP, syn	2.98(11)
Muscovite-2M1	71.1(10)
Zeolite P, (Na)	25.9(4)

Table 4. Activation by Heating 400^o C Zeolite 400^oC

Phase name	content(%)
Quartz low, syn	66.1(15)
Muscovite-2M1	20(2)
Zeolite F (Na), Pentasodium tecto-pentaalumopentasilicate nonahydrate	13.9(6)

Table 5. Absorbance and Decrease the Actual Concentration

Phase name	content(%)
Quartz, syn	45(10)
Albite, ordered	26(5)
potassium tecto-alumotrisilicate	9(3)
Zeolite Nu-6(2), Silicon dioxide	2.5(5)
Muscovite-2M1	14(5)
Sodalite	3.1(7)

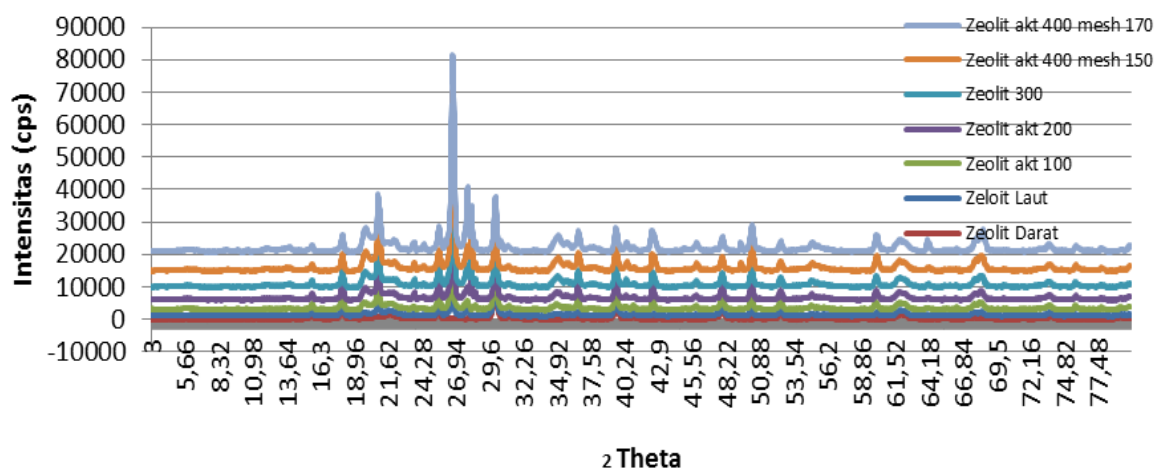


Figure 2. Characterized by X-Ray Diffraction Type Rigaku Miniflex II

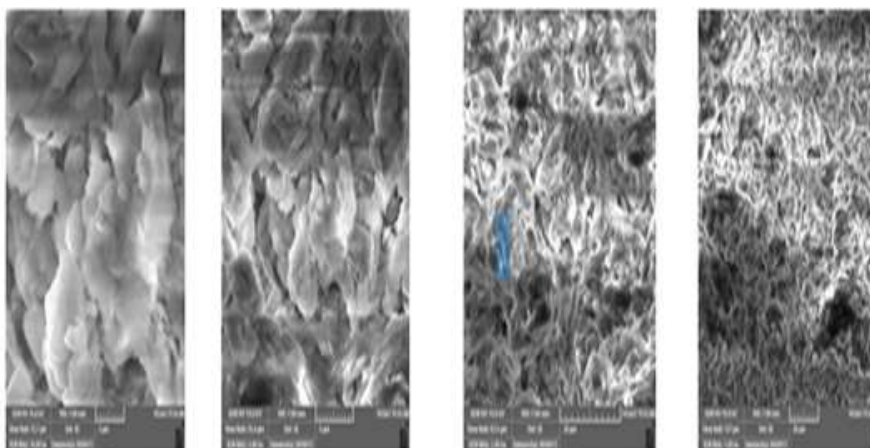


Figure 3: Scanning Electron Microscope – Energy Dispersive Spectroscopy (SEM-EDX) type TESCAN 3 VEGA Natural Zeolite Activation (100^o C, 200^o C, 300^o C, and 400^o C).

By looking at the results in the Table 4 that the heating 200°C, decreasing the concentration of the most effective is - 0.2902 with a time of 180 seconds. Furthermore Fig. 4 describes the relationship between absorbance and contact time. It shows after an interval of 180 seconds, the value of the absorption becomes constant.

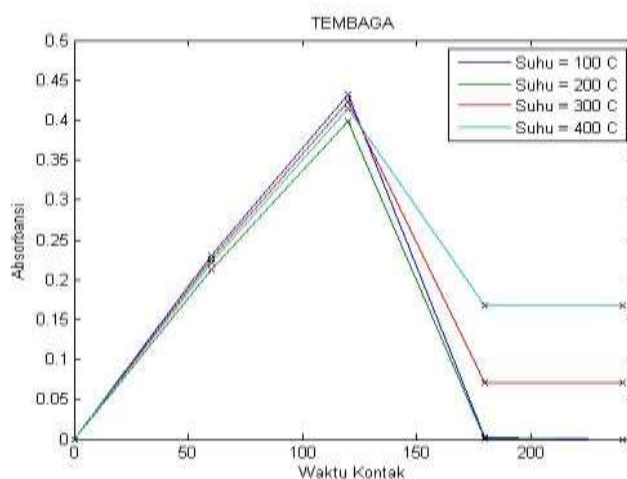


Figure 4: Relationships absorbance and contact time with several temperatures

4. CONCLUSION

Maximum absorbance and decrease the actual concentration of heavy metals Copper (Cu) by South Sulawesi natural zeolite as filter media in the raw water by means of laboratory tests obtained the following results South Sulawesi Natural zeolite as filter media and absorbance able to entrap heavy metals Cu in the raw water. To produce an inexpensive water treatment model with available natural resources and can be used in areas that are difficult to get clean water.

5. REFERENCES

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