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Characerization of Geochemical Waste Rock on Indicate and Mitigation Acid Mine Drainage at Coal Mining Bukit Asam Tanjung Enim

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ABSTRACT

Acid mine drainage (AMD is a term generally used to describe infiltration of acid surface water in the mining areas. The study of the processs for formation acidmine drainage can be approached by two methods, the static and kinetic test. In the static test, that formed acidare determined by total sulphur content with an assumption that all sulphur contented in the stones are oxidized. While in the kinetic test, the acid are determined from is reaction stoichiometrically by using total both ion Fe^{2+} and H^{+}, solved in the water as data in calculation. Kinetis test methods can be applicated with leached column test.
Kinetic analysis of the test results on 5 samples of coal mine waste rock, it can be said that each of the rock samples as potentially acid forming rock it can be stated from the results of the analysis on pH value, content of Fe metal, ion sulfate and TSS of leachate obtained.

Keyword: Waste Rocks, Acid Mine drainage, Kinetic test

1. INTRODUCTION

Coal is one of the important energy source for the world, which is used for power plants that can produce nearly 40% of worldwide electricity. In many countries the figures are much higher: Poland uses more than 94% of coal for power generation; South Africa 92%; China 77%; and Australia 76%. Coal is an energy source that is experiencing the most rapid growth in the world in recent years - faster than gas, oil, nuclear, hydro and renewables.

The relationship between mining activities with the environment has always been a hot issue today. One part of concern is water pollution caused by mining activities, including the Acid Mine Drrainage problems (AMD). Acid mine Drainage management efforts is very important to minimize negative risks to human health and the environment.

Therefore, water management always been one of the major challenges faced by the mining industry. To that end, research and development towards the prevention and mitigation of acid mine drainage importantly will serve to optimize the performance of acid mine water management in the field.

Geochemical characterization of rocks as part of efforts to acid mine drainage prediction, can be done through the static test. Static testing is done by determining the sulfur content of the sample and how much acid can be neutralized by the sample. With a static test, is expected to predict the geochemical characteristics that exist in the field via clustering of rock PAF (Potentially Acid Forming) or NAF (Non-Acid Forming) which are useful in the preventive management of acid mine drainage sustainable, such as the encapsulation process rock PAF by

NAF rock. However, this test still has limitations because it can also provide information UC (Uncertain) is a condition that is not apparent between APF or NAF. Other than that, the results of the static test does not provide information when acid formation will occur, the rate of acid formation and neutralization, or quality of water due to the sample.

By means of kinetic geochemical testing is commonly used to confirm the results of static tests, in addition, can also be used to determine the relative rate of sulfide mineral weathering and oxidation reactions at the same time neutralizing analysis by alkaline minerals present in the rock and metal solubility test useful for testing control techniques and handling due to acid mine drainage.

In the kinetic test, simulating leaching and weathering care should be taken to match the existing conditions in the field. According to its development, several laboratory-scale kinetic tests that have been known to include the Humidity Test Cells, Column Leaching Test, Soxhlet Reactor and Shake Flask. Scale laboratory used to study the reactions occurring more specific. The test results provide information kinetic reaction rate with respect to time, the period of time for the reaction, and is expected to be a reference to the control techniques that can help treat Acid Mine in the field.

In the process of kinetic test that will be delivered to the kinetic test by applying the method Free Draining Column Leach or column method Lindos.

2. METHODS

The study was conducted in the laboratory of the Polytechnic of Sriwijaya and laboratory PTBA country. With the following process steps: sample preparation, tools, materials, and analysis of the carrying

Table 1. CODE SAMPLES

No	Listing Samples	X	Y
1	A	362257E	9589795N
2	B	362285E	9589817N
3	C	363205E	9590045N
4	D	363305E	9589772N
5	E	365800E	9589635N

Source: data primer 2013

Rock samples taken from the coal mines of coal mine disposal site as much as five points with code samples A, B, C, D and E. The sample code is given for each coordinate according to the sampling point can be seen in Table 1. Sample Waste rocks done preparation with size distribution 20 # and 60# on each samples

2.1. Tools and Materials

Tools used: a set of kinetic test apparatus (column Lindos), AAS, pH meter, analytical balance.

Materials used: rock sample, as many as 5 pieces, distilled water, HCl2..2 .

Procedures :

- Considering the soil sample (disposal) of 250 grams with a size distribution of 20 #. 60 # and 100 #
- Enter in column leachate (tube diameter 10 cm and height 6 cm)
- Stream water (flushing) with 250 mL water
- Analysis of pH, metal ions from leachate and TSS for each rock

3. RESULTS

Results of kinetic test each sample to the parameters pH, Fe, SO4 and TSS from Leached process water can be plotted in graph form as depicted in the diagram fig. 1 up to 8.

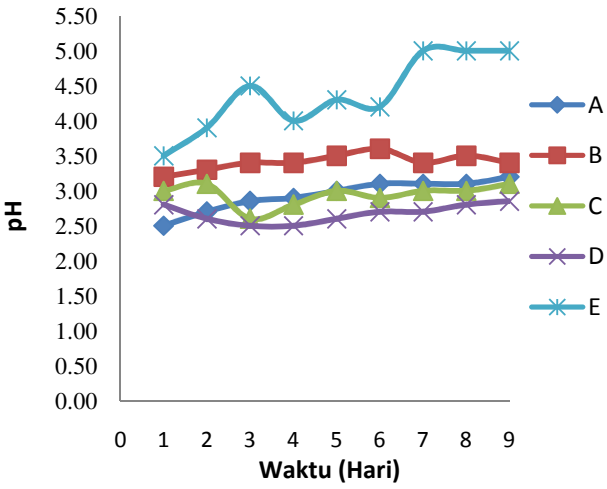

Fig. 1. pH water Leach

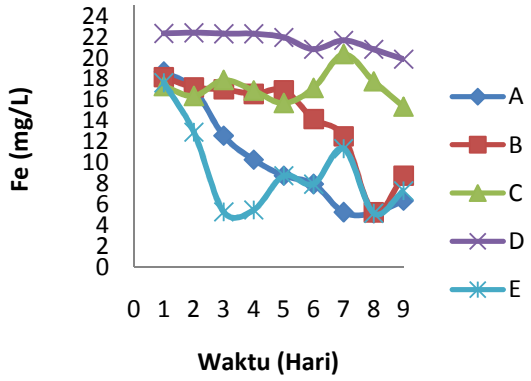

Fig. 3 . Concerntration ions Fe^{2-} in water Leach

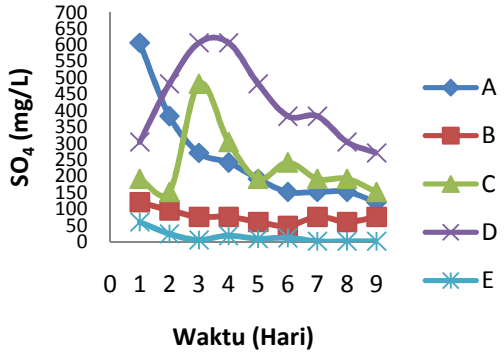

Fig. 2. Concerntration ions SO_4^{2-} water Leach

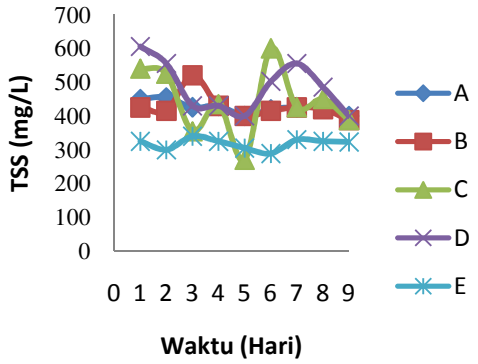

Fig. 4. Concerntration TSS in water Leach

From the results of analysis of Water samples for 5 lindian rocks conducted test kinetic then it can be analyzed that the pH of the water pH water contributes lindian lindian has considerable acidity which each Rock will provide a very significant pH change according to the nature of the rock, from the static test of rock D is rock containing sulfur in large, so that the pH of the solution is also contribution provides a range of very small changes to the time span of this process reveals the nature of acidity each sample leachate graph can be seen in Figure 1.

Analysis content metal ion fe2 + of pictures 2 content metals in leachate sample also contributes that accuracy against the nature of content of sulphur in rocks and also with the ph solution, from graphs relations content ions ferro with time the process to be said rock d also contributes great content ions fe in water lindiannya.

Analysis of ion sulfides also contribute significantly in the acidity of leachate each sample and content of sulfides also depends on the ions of sulphur, and the acidity of the solution.

Analysis of total suspended solid views of graphs in Fig. 4 TSS content in leachate is it depends of the brittleness of rocks. Judging from the quality of the raw waste water from coal mine where the standard cracker, pH 6-7, 7 ppm Metal sulfide ions, 500, and 400 ppm TSS then it can be stated that the water samples from all the leachate not include standard for mine waste water as a parameter.

CONCLUSION

From resul and discussion of paper can be conclusion :

a. Kinetic Test can give you an idea of the kinetics of acid mine water pembetukan with the method of simulating leaching to some sample rocks PAF

b. Result of kinetic test at each sample rock waste, it can be as formation contributes to acid mined drainage. So that can be see from characterized of leachate is hight acidity, ions Fe^{2+}, ion sulfate and a high TSS .

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REFERENCES

[1] Benzaazoua, M, Bussie 're,B, A.M, Dagenais, Archambault (2004), Kinetics Tests Comarissons and Interpretation for Prediction of the Joutel tailings Acid Generation potential, Journal of Environmental Geology 1086-101

[2] Hessley, R. K.,Reasoner J. W. (1986),, and Riley J. T. , *Coal Science,*John Wiley and Sons, New York, 81 - 87

[3]Journal of Nuclear Science and Technology,2001, Vol. 38, No. 9, p. 766-772

[4] Honrnbeerger, R, Brady, Chapter 5, Static Test for the Prediction of Mine drainage Quality, *The Department of environmental Protection : Puttsville*

[5] Rose, Arthur W, Cravotta, Chapter 1: geochemistry, of Coal Mine Drainage *Department of Geoscience, Pen State University*

[6] Tear, A, Schuler, Freeman W. J and Smith, R (1978) Field and Laboratory methods Applicable to overburdens and minesoils, (Virginia Morgantown Udayana University College of agriculture and forestry) economic partnership agreement (EPA) - 600/7-2-054, P-47.50

[7] _____1997 , TimikaEnviromental Laboratory, PT Freeport Indonesia Test Method- Acid Neutralising Capacity

[8] Smart, Roger, (2002), HIGH Test handbook: Project P387A Predection& Kinetic Control Acid Mine Drainage , *Melbourne Australia*: AMIRA *International Limited*

[9] U.S, EnviromentalPratection Agency (EPA) (2009), Static Test and Kinetic Test Methodes for Prediction of Mine Drainage Quality,