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FUNDAMENTAL RESEARCH OF FLY ASH AND ORGANIC MATERIAL UTILIZATION AS DRY COVER LAYER FOR ACID MINE DRAINAGE PREVENTION METHOD: COLUMN LEACHING STUDY

SENDY DWIKI[1], HIDEKI SHIMADA[2], RUDY S. GAUTAMA[3], TAKASHI SASAOKA[4] & GINTING J. KUSUMA[5]

[1,2,4]Department of Earth Resources Engineering, Faculty of Engineering, Kyushu University, Japan

[3,5]Department of Mining Engineering, Institut Teknologi Bandung, Bandung, Indonesia

ABSTRACT

Over the past few years, Indonesia has been accounted as one of the biggest countries in producing the coal for energy source. In 2011, Indonesia became the top exporter of coal steam in the world and keep becoming the top five up until now. This has also been accompanied by the promoted domestic coal demand since the government regulations about domestic market obligation and the national energy mix plan in 2030 were issued to increase domestic coal uses. As the result, coal mines in Indonesia are abundant and still increase. Despite the benefit of mining, the growth of mines implies to the growing negative environmental effects caused by mining activity. One of the negative effects is acid mine drainage (AMD). AMD is a severe water pollution issue in the coal mine. AMD occurs because of the sulfide mineral oxidation by oxygen in the presence of water which produces acidity. Consequently, acidic water with elevated concentration of dissolved heavy metals is resulted. As a major issue in the mining, AMD has to be minimized. This is important because AMD heavily affect living organisms and harm the ecosystem by flowing to the surface and groundwater. Moreover, AMD treatment is an expensive as well as complicated matter to be conducted which need a long term management system. Therefore, an AMD prevention method is favorable and needs to be applied on the mine.

The common practice in AMD prevention is a dry cover technique. In this technique, rock that is potential in producing acidity (PAF) will be placed below non-acid producing rock (NAF). However, several issues regarding the material availability could be faced because dry cover is a site specific method that depends on the mine site situation. This research mainly aims to overcome the problems that commonly happen to Indonesia mining site and the world: shortage of non-acid forming rock and the lack capacity of neutralizing capacity. The utilization of additional material cover layer is proposed, by using fly ash and organic material combination. Fly ash is known for its alkaline properties while organic material could consume the oxygen during the degradation process. To investigate the possibility of using these materials, a column leaching test in the laboratory scale was conducted with several scenarios of simulation. The leachate water behavior is observed in the experiment, including the measurement of water quality (pH and EC), major cations-anions, dissolved metal concentration and total organic carbon. The result suggests the application of fly ash and organic material as cover layer material, especially in the case of mine with domination of PAF rock material. By comparing between column with and without the additional cover layer, the leachate water was improved sufficiently.

KEYWORDS: Fundamental Research