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Abstract Index

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Fuzzy Logic Approach for Post-Mining Land Use Planning: A Case Study on Coal Mine of PT. Adaro Indonesia-South Kalimantan

Pendekatan Fuzzy Logic untuk Perencanaan Pascatambang: Studi Kasus pada Tambang Batubara PT. Adaro Indonesia-Kalimantan Selatan
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Currently coal companies, especially in South Kalimantan, have not yet been or only slightly entered the post-mining stage, although part of the mining blocks have been totally exploited, so that the company should have been preparing for the development of other sectors (non-mining). It shows that optimization of coal resources from exploration, mining to post-mining land use is necessary to ensure sustainable mining and sustainable development in terms of meeting the conservation aspect. To meet all aspects of conservation, the achievement of optimization in a series of mining business activities is started from the potential optimization of the coal remain resources until the optimization of post-mining land use is absolutely required. This research has analyzed several alternative sectors outside mining, which will be selected for optimization of utilization or post-mining land use, including plantation, recreation, industry and conservation sectors. The analyzing process used several parameters to assess the selected sectors including rainfall, slope and land use. Therefore, this study uses an approach of GIS-based methods (knowledge-driven), mainly fuzzy logic for post-mining land use planning. The selected mining area for this study belongs to PT. Adaro Indonesia company that has a Work Agreement for Coal Mining Exploitation. The result shows the suitability of plantation for the optimization of land use in all mining sites and also for conservation areas or protected forests.

Keywords: optimization, land use, post-mining, fuzzy logic

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Geology and Characteristics of Low Sulphidation Epithermal Vein in Senepo Area, East Java

Geologi dan Karakteristik Endapan Urat Epitermal Sulfida Rendah Daerah Senepo, Jawa Timur
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Senepo area is one of several epithermal mineralization prospects in Southern Mountains of Java Island. This study is aimed to investigate the geological framework and hydrothermal alteration of the prospect as well as to characterize the low sulphidation (LS) epithermal vein including vein textures, ore mineral, ore chemistry and hydrothermal fluid that are responsible for the formation of the quartz vein. Detailed field mapping was completed to understand the geological framework and hydrothermal alteration zones. Petrographic, ore microscopic, XRD and AAS analyses were applied to characterize the quartz vein. The study area is occupied by pebbly sandstone, andesite breccia, andesite units and alluvial deposit. Ore mineralization is mainly hosted by andesite of Oligo-Miocene of Watupatok Formation. The host-rock has been suffered by overprinted hydrothermal alteration and weathering. The epithermal veins are found as N-S-trending quartz veins with a thickness of 1-2 meters. These veins show massive texture, crustiform, cockade, druzy, comb, and disseminated sulphides, which is included in Crystalline Quartz Zonation (X). Optical microscopy and XRD analysis indicate that these veins contain several ore minerals such as chalcopyrite, sphalerite, galena, pyrite, hematite, covellite and malachite, associated with gangue mineral including quartz, feldspar, chlorite and clay minerals. AAS analysis displays variable chemical composition of precious and base metals such as Au (17-37 ppb), Ag (8.1-32.6 ppm), Cu (122.1-81,450 ppm), Pb (35.4-883.6 ppm) and Zn (18.3-2,628 ppm). Gold and silver are relatively low compared to the base metals. Fluid inclusion micro thermometric analysis indicates that ore mineralization originated at temperatures of 187-263 °C and salinity of 0.18-0.53 % wt. NaCl eq. This salinity corresponds with a minimum hydrostatic pressure of about 10-55.1 bars. Based on those characteristic data, mineralized quartz veins in the study area are classified into a base metal horizon of LS epithermal system.

Keywords: geology, alteration, characteristics, quartz vein, ore mineralization, Senepo

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Bioleaching of Lodan Quartz Using *Aspergillus ficuum*

*Bioleaching Pasir Kuarsa Lodan Menggunakan *Aspergillus ficuum**

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Depending on its purity, quartz has a wide application in industry. Fungi play an important role in the quartz purification. A bioleaching study of Lodan quartz sample from Rembang, Central Java was conducted to obtain a suitable raw material for industrial applications. The microbial process using selected-indigenous fungus of *Aspergillus ficuum* in terms of removing iron, aluminum, and other unwanted metals within quartz. The result was then compared to the chemical leaching using pure citric and oxalic acids. The bioleaching process removed the iron (Fe_2O_3) from the initial content (0.78%) in the original sand sample to reach a level of 0.013%. Almost 98.3% iron was removed. The bioleaching test also removed the aluminum, manganese, chrome, and titanium to a very low level within the 12-day process. The iron content in this treated quartz met the standards for optical and high-quality glass. On the other hand, the chemical leaching using pure citric and oxalic acids concentrations were equal to those that were produced by *A. ficuum* could only removed 70.5% of iron around 0.23% iron and 0.29 % aluminium were still remained in the sand. This fact suggested that the bioleaching method is more effective than the chemical one using the organic acids. The use of fungi to remove iron from quartz has the potential to be an effective method for upgrading the content and the commercial value of the quartz. The experimental results of this study have provided significant opportunity to use biotechnological approach for producing the quartz as a feed material for the high-quality glass industry.

Keywords: *Aspergillus ficuum*, bioleaching, citric acid, oxalic acid, quartz

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Study on Combustion Characteristics of Coal-Biomass for Co-Firing System as a Feedstock of Coal Gasification Process

Studi Sifat Pembakaran Batubara-Biomassa untuk Sistem Pembakaran Bersama sebagai Umpan Proses Gasifikasi Batubara

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Biomass co-firing is recognised as a crucial technology to aid in the use of fossil fuels, particularly due to its relative ease of implementation. Many studies of the combustion processes associated with co-firing have been conducted elsewhere. This paper discusses the

combustion characteristics of coal and torrefied biomasses. Combustion profiles can be used to study certain combustion properties of fuels and fuel blends. The biomass fuels utilized in this study include twig, trunk and weed as the wastes from tea plantation. The results of this work provide data concerning the combustion processes of co-firing determined by simultaneous thermal analysis (STA) methods. Simultaneous thermogravimetric & differential scanning calorimetry/differential thermal analysis (STA, TGA-DSC/DTA) measures both the heat flow (DSC) and the weight changes (TG) in a material as a function of temperature or time in a controlled atmosphere. The results indicate that the mixture of coal and torrefied trunk in the weight ratio of coal-trunk of 25:75 shows the best combustion performance compared to other compositions of coal – torrefied biomass.

Keywords: coal, biomass, co-firing, torrefaction, combustion

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The Financial Feasibility Analysis for Construction Plan of Ferro-Nickel (Fe-Ni) Smelter Plant at South Konawe Regency, South East Sulawesi

Analisis Kelayakan Finansial Rencana Pembangunan Pabrik Peleburan Ferro-Nikel (Fe-Ni) di Kabupaten Konawe Selatan, Sulawesi Tenggara

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The objective of the study is to comprehend the feasibility for construction plan of smelter plant to process the nickel laterite into ferronickel (Fe-Ni). PT. Macika Mineral Industries (PT. MMI), located at Lolowua village South Konawe, Southeast Sulawesi will implement such a plan Law No. 4 of 2009 on Mineral and Coal Mining obliges the mining investors to process the minerals into semi-finished or finished products in the domestic country before selling them abroad. The raw materials for PT. MMI smelter plant will be supplied by PT. Macika Mada Madana (PT. MMM) as one of PT. MMI group members PT. MMI is the holder of Production Operation Mining Permit that covers an area of 705 Ha and is located in Watudemba village, Palangga District and Keono Village, South Palangga District, South Konawe Regency. The mining area of PT. MMI is located 7 km from the PT. MMM planned plant. The total Ni reserve owned by PT. MMM is 18,930,700 tons. Of 18,930,700 ton reserves; 4,390,645 tons belongs to the measured one performing the average grade of nickel and iron around 1.97 and 23.14% respectively while around 14,540,055 tons that contain the average grade of nickel and iron about 1.92 and 23.14% respectively goes to the inferred reserve. PT. MMI requires 960,000 tons per year of Ni raw material it means that PT. MMM can supply the processing plant up to 20 years. Net present value (NPV), internal rate of return (IRR), return on investment (ROI), payback period (B/P), benefit cost ratio (B / CR), and breakeven point

(BEP) are the criteria for evaluating the financial need of PT. MMI. The results showed that the NPV was about US\$ 726,883,479 while the IRR and the ROI were around 18.00% and 212.90% respectively. Calculating the PBP and the B/C achieved 6.19 years and 3.21 correspondingly. The reached BEP was US\$ 754 per ton for the production of 50,504 tons. The analysis showed that the construction of ferro nickel (Fe-Ni) plant by PT. MMI was financially acceptable to be. However, using several variable measurements in analyzing the

sensitivity of the business, namely by the selling price of ferro nickel is assumed to be reduced by 5% and production cost is increased by 5%, the plan is not sensitive to decreasing selling price and increasing production cost.

Keywords: financial analysis, feasibility, processing, smelting, ferronickel, value added