

KEYWORD INDEX

A

alteration, 93
anode slime, 31
Aspergillus ficuum, 105

B

bioleaching, 105
biomass, 115
bullion, 39

C

cake, 39
characteristics, 93
chlorination process, 31
citric acid, 105
coal, 1, 115
co-firing, 115
combustion, 115
concentrated iron sand, 59

E

electrolyte, 39
electrowinning, 39

F

feasibility, 131
ferronickel, 131
financial analysis, 131
fluosilicic acid, 69
fuzzy logic, 81

G

galena, leaching, 69
geology, 93
gold and silver, 39

I

iron nugget, 59
iron sand, 49

K

Krupp-Renn technology, 59

L

land use, 81
loaded carbon, 39

M

maceral, 1
magnetic separation, 49

O

optimization, 81
ore mineralization, 93
oxalic acid, 105
oxidation and reduction processes, 59

P

particle size, 49
peroxide, 69
post-mining, 81
precipitation, 69
processing, 131

Q

quartz vein, 93
quartz, 105

R

rank, 1
rotary kiln, 59

S

Senepo, 93
silver extraction, 31
silver recovery, 31
smelting, 131

T

titanium oxide, 49
torrefaction, 115
type, 1

V

value added, 131

W

western Indonesia, 1

AUTHORS INDEX

A

Arifudin Idrus, 81, 93

B

Binarko Santoso, 1

D

Datin F. Umar, 115

Dessy Amalia, 69

E

Esti Handayani, 93

F

Fahmi Sulistyohadi, 115

G

Gandhi K. Hudaya, 115

H

Harta Haryadi, 131

Hasudungan E. Mamby, 59

Hendra Amijaya, 81

I

Isyatun Rodliyah, 31

L

Lili Tahli, 39

M

Maryono, 69

Mohamad Anis, 81

N

Nuryadi Saleh, 59

S

Siti Rochani, 31

Siti Rochani, 59

Sri Handayani, 103

Subagyo, 81

Suratman, 49

T

Tatang Wahyudi, 39

Y

Yunita Ramanda, 69

INDEX OF ABSTRACTS

1. Binarko Santoso

PETROGRAPHIC CHARACTERISTICS OF SELECTED TERTIARY COALS FROM WESTERN INDONESIA ACCORDING TO THEIR GEOLOGICAL ASPECTS

KARAKTERISTIK PETROGRAFIS BATUBARA TERSIER INDONESIA BAGIAN BARAT BERDASARKAN ASPEK-ASPEK GEOLOGISNYA

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 1 - 30

Selected Tertiary coals from the western part of Indonesia (Sumatera, Kalimantan and Java) indicate similarities and differences in type and rank characteristics. These coals reflect their geological setting, particularly for intrusive and stratigraphic aspects. Type and rank of the coals were assessed by petrographic examination. The coals are mainly dominated by vitrinite, common liptinite and rare inertinite and mineral matter. Vitrinite macerals are dominated detrovitrinite and telovitrinite. Resinite, cutinite and suberinite are the dominant liptinite macerals in the coals. Inertinite macerals in the coals consist of semifusinite, sclerotinite and inertodetrinite. The type differences largely reflect climatic influence and differences in peat conditions. In spite of short geological history, the coals exhibit variable vitrinite reflectances. The high vitrinite reflectance of the coals is a result of higher regional coalification levels in the basins associated with greater cover and effects of igneous intrusions.

Keywords: coal, maceral, type, rank, western Indonesia.

2. Isyatun Rodliyah and Siti Rochani

EXTRACTING SILVER FROM ANODE SLIME AFTER LEAD AND GOLD SEPARATIONS

EKSTRAKSI PERAK DARI LUMPUR ANODA SETELAH PEMISAHAN TIMBAL DAN EMAS

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 31 - 38

Anode slime, a byproduct from the process of copper electrorefining into the copper cathode, contains several valuable elements that can be extracted after Cu and Pb separations. Another alternative route for extracting the precious metals is still needed in terms of gaining more economical route. This research aims to seek the new route to extract the precious metals, especially silver from anode slime. In these experiments, the anode slime was obtained from PT Smelting Gresik. The lead was separated to

produce the residue which was then chlorinated to extract the gold. Later the residue was used for extracting the silver by dissolving it in ammonium hydroxide solution with varying time dissolutions and concentrations and later dissolving in hydrochloric acid to form silver chloride which was reduced to metallic silver. These experiments had two trials. The first one related to directly using residual chlorination after gold separation and the second one employed the same residual chlorination but processed through de-chlorination by adding sodium carbonate. The result showed that the highest silver recovery of 53.56% related to 5 M ammonium hydroxide concentration, the temperature of 30°C, dissolution time of 60 minutes. Recovery of 53.78% was achieved at 7 M ammonium hydroxide, the temperature of 30°C, dissolution time of 60 minutes. The feed of those experiments came from direct residual chlorination, while chlorination residue that underwent de-chlorination produced silver recovery of 94.95% with leaching conditions of 5 M ammonium hydroxide, the heating temperature of 30°C and leaching time of 60 minutes. The latest recovery was relatively high resulted in the process could be scaled up to a continuous system.chlorinated to extract the gold.

Keywords: anode slime, silver recovery, silver extraction, chlorination process

3. Lili Tahli and Tatang Wahyudi

DESORPTION OF GOLD AND SILVER FROM ACTIVATED CARBON

DESORPSI EMAS DAN PERAK DARI KARBON AKTIF

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 39 - 47

Experiments of gold and silver elution were conducted using several parameters, either fixed or varying parameters. Ethanol volume, temperature and percent solid belonged to varying parameters while loaded carbon, stirring rate, concentrations of NaOH and NaCN served as fixed parameters. The experiment results showed that the optimum condition for such a process included 20% of ethanol volume, 80°C of temperature and solid fraction of 25%. Using such condition, the experiment was conducted for 10-hour contact time and yielded the highest desorption percentages for gold and silver, namely 80.10 and 70.73% respectively. The derived contents of gold and silver were 295.16 and 159.38 ppm while their achieved weights were 56.080 and 30.601 μ g. The fact that the

achieved contents of gold and silver was close to the requirements for electrowinning process, it is suggested that the next process using a semi-continue one in terms of gaining a result that satisfies the requirement for electrowinning.

Keywords: loaded carbon, electrolyte, electrowinning, cake, bullion, gold and silver

4. Suratman

DISTRIBUTION CHARACTERISTICS OF FERRO-TITANIUM OXIDE MINERAL ON LOW-GRADE IRON SAND

KARAKTERISTIK DISTRIBUSI MINERAL BESI-TITANIUM OKSIDA PADA PASIR BESI KADAR RENDAH

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 49 - 58

Iron sand is known as one of the sources of TiO_2 in the form of ilmenite or titanomagnetite mineral. Iron-titanium oxide mineral contained in Indonesia iron sand are classified as titanomagnetite. Indonesia possesses a lot of iron sand deposits such as at southern coast of Cilacap, Kebumen and other areas. The iron sand consists of magnetic and non-magnetic minerals as either loses or bound materials. Fractionation of Cilacap iron sand which employed three types of sieve (40, 60 and 80 meshes) showed that the iron sand is dominant in -40+60 fraction (68.38 g) while the most amount of iron and titania contents occurred at fraction of -80 mesh, namely 11.62 and 1.46%. Magnetic separation showed that the finer the particles and the higher the magnetic intensity, the higher the derived iron and titania. The process has also successfully increased the TiO_2 content more than 5 times, from 0.325 to 1.67%.

Keywords: iron sand, particle size, magnetic separation, titanium oxide

5. Nuryadi Saleh, Siti Rochani and Hasudungan E. Mamby

MAKING OF IRON NUGGET FROM CONCENTRATED IRON SAND USING MINI-SIZED ROTARY KILN

PEMBUATAN NUGET BESI DARI KONSENTRAT PASIR BESI MENGGUNAKAN TUNGKU PUTAR MINI

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 59 - 68

The availability of energy becomes a major problem in the construction of iron mineral-based

smelter to produce ferrous metals in the form of pig iron. Therefore, it is necessary to develop the Krupp-Renn technology that based on coal as a reducing agent to produce pig iron in the form of nuggets. Such a technology employs a rotary kiln that consumes less energy than other furnaces. In this study, reduction process of iron sand concentrates with coal as the reductant was accomplished in a mini-sized rotary kiln (0.6 m diameter and 6 m length). The process of iron nugget making from iron sand concentrate was conducted in two (2) stages, namely oxidation and reduction processes. The former was accomplished at a temperature above 800°C for 2 (two) hours to produce hematite phase. While the later was carried out at 1250-1300°C for 6-8 hours. Both processes produced iron nuggets that contained more than 90% Fe. The highest Fe content reached 96.49% Fe. Such a nugget could meet the requirement for steel making.

Keywords: iron nugget, rotary kiln, Krupp-Renn technology, concentrated iron sand, oxidation and reduction processes

6. Dessy Amalia, Yunita Ramanda and Maryono

EXTRACTION OF LEAD FROM GALENA CONCENTRATES USING FLUOSILICIC ACID AND PEROXIDE

EKSTRAKSI TIMBAL DARI KONSENTRAT GALENA MENGGUNAKAN ASAM FLUOSILIKAT DAN PEROKSIDA

Indonesian Mining Journal, Volume 20, Number 1, April 2017, P. 69 - 80

A study on lead extraction from lead concentrate had been conducted. Galena is usually associated with other sulfide ores such as sphalerite. The lead concentrate was able to be extracted and purified into its metal through a leaching process using a selective solvent of fluosilicic acid (H_2SiF_6). Parameters used in this process include ratio (dose) of reactant ($H_2SiF_6:H_2O_2$), temperature (without heating; 30; 50; 70; 80; and 90°C) and particle size (-100+150#, -150+200#, -200+325, dan -325#). The best extraction was achieved using the particle size of -325 mesh. The amount of extracted lead was increased due to the rise of temperature and dose of fluosilicic. The amount of peroxide addition was determined by its optimum influence on the lead extraction because its excess would produce $PbSO_4$. The influence of H_2SiF_6 and H_2O_2 doses was calculated using ANOVA.

Keywords: galena, leaching, fluosilicic acid, peroxide, precipitation

7. Mohamad Anis, Arifudin Idrus, Hendra Amijaya and Subagyo

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

Indonesian Mining Journal, Volume 20, Number 2, October 2017, P. 81 - 91

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

8. Arifudin Idrus and Esti Handayani

GEOLOGY AND CHARACTERISTICS OF LOW SULPHIDATION EPITHERMAL VEIN IN SENEPO AREA, EAST JAVA

GEOLOGI DAN KARAKTERISTIK ENDAPAN URAT EPITERMAL SULFIDA RENDAH DAERAH SENOPO, JAWA TIMUR

Indonesian Mining Journal, Volume 20, Number 2, October 2017, P. 93 - 103

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

9. Sri Handayani

BIOLEACHING OF LODAN QUARTZ USING *Aspergillus ficuum*

*BIOLEACHING PASIR KUARSA MENGGUNAKAN *Aspergillus ficuum**

Indonesian Mining Journal, Volume 20, Number 2, October 2017, P. 105 - 113

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

10. Datin F. Umar, Gandhi K. Hudaya and Fahmi Sulistyohadi

STUDY OF 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

Indonesian Mining Journal, Volume 20, Number 2, October 2017, P. 115 - 130

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

11. Harta Haryadi

THE FINANCIAL FEASIBILITY ANALYSIS FOR CONSTRUCTION PLAN OF FERRO-NICKEL (Fe-Ni) SMELTER PLANT AT SOUTH KONAWA REGENCY, SOUTH EAST SULAWESI

ANALISIS KELAYAKAN FINANSIAL RENCANA PEMBANGUNAN PABRIK PELEBURAN FERRO-NIKEL (Fe-Ni) DI KABUPATEN KONAWA SELATAN, SULAWESI TENGGARA

Indonesian Mining Journal, Volume 20, Number 2, October 2017, P. 131 - 142

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 (PBP), 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

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- Kuhn, C. and Ciullo, P.A. (1996) "Mineral surface modification. . In: Ciullo, P.A. (ed.)," *Industrial minerals and their uses - a handbook and formulary*, Noyes Publications, Westwood, New Jersey, USA, p. 83-98.
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Nas, C. and Daulay, B. (2000) "Organic petrography," *29th Annual Convention IAGI*, Bandung, 17 p.

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