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INDEX OF ABSTRACTS

1. Titin S. Fatimah, Atiek R. Noviyanti, Juliandri and Solihudin

SYNTHESIS AND CHARACTERIZATION OF GAMMA ALUMINA NAD ITS ADSORPTION CAPABILITY TEST FOR POMALAA MAGNESIUM LATERITE, SOUTHEAST SULAWESI
SINTESIS DAN KARAKTERISASI GAMA ALUMINA SERTA PENGUJIAN KEMAMPUAN ADSORPSINYA PADA MAGNESIUM LATERIT ASAL POMALAA, SULAWESI TENGGARA

Based on variations in calcination temperature, gamma alumina has successfully been made using a simple sol-gel method for Pomalaa magnesium-laterite adsorption from the South East of Sulawesi. The laterite leached by sulfuric acid was then precipitated by ammonia, to make the magnesium was separated from its main impurities (Si, Fe and Al). Temperature variations at 500, 650, 800 and 950 °C in gamma alumina making formed the gamma alumina phase while the alpha alumina phase was formed at 1100 °C. The higher calcination temperature the lower the specific surface area respectively from 196.385, 156.239, 105.725, 96.134 and 15.396 (m^2/g). This results in decreasing the magnesium of the laterite 9.04, 8.70, 8.09, 6.39 and 0.29 (mg/L) respectively. The 800 °C-calcination gamma alumina has the highest volume of the pore, namely 0.3265 mL/g and the radius of 61.76 Å. The gamma alumina isotherm curve is type IV. The SEM-EDS test shows an aggregation spherical shape. Gamma alumina was detected to adsorb Mg laterite. The X-ray mapping of SEM-EDS test shows even distribution between gamma alumina, magnesium, and nickel. The highest adsorption is retained by GA-800/3 sample, namely 81.31 %.

Keywords: adsorption, gamma alumina, leaching, isotherm, sol-gel.

2. Widodo, Solihin and Subari

EFFECT OF KARANGNUNGGAL BENTONITE ADDITION ON THE MECHANICAL STRENGTH OF CONVENTIONAL CERAMICS
PENGARUH PENAMBAHAN BENTONIT KARANGNUNGGAL TERHADAP KEKUATAN MEKANIK KERAMIK KONVENSIONAL

Bentonite can be used as an additive in ceramics production. It can increase the thermal resistance and flexural strength of ceramics. Indonesia has a large amount of bentonite deposit. One of them is located in Karangnunggal, Tasikmalaya. The aim of this research is to study the effect of bentonite to increase the flexural strength of ceramic. The raw materials consisting of kaolin, feldspar, and quartz were used as raw materials in ceramics production. The weight percents of kaolin and quartz were fixed at 55 % and 20 %, whereas weight percents of feldspar and bentonite were varied at 25 %, 20 %, 15 %, 10 % and 0,5 %, 10 %, 15 %. The firing temperature was kept at 1,200 °C. Result of the experiment shows that the best composition to achieve the highest dry flexural strength at 254.70 kg/cm^2 is at 55 % kaolin, 20 % quartz, 15 % feldspar, and 10 % bentonite.

Keywords: bentonite, additive, ceramics, flexural

3. Solihin, Pratama Arinaldo, Nanda S. Dewi and Haryadi Permana

THE KINETIC PROFILE OF IRON DISSOLUTION FROM LATERITE ORE IN CHLORIC ACID SOLUTION
PROFIL KINETIKA PELARUTAN BESI DARI BIJIH LATERIT DALAM LARUTAN KLORIDA

Indonesia has large amount of laterite deposits located in Southeast Sulawesi. The laterite contains significant amount of iron. The ore has been processed through high temperature. The high temperature consumes a lot of energy and releases a lot of carbon dioxide. The low temperature of the process is simple and needs less energy. Leaching the ore is the important stage in low temperature which determines the recovery of valuable metal from the ore. This work observes the kinetic aspect of iron dissolution in the process based on the shrinking core model. The data of iron dissolution at temperature 30, 50, 70 and 90 °C are plotted into chemical reaction control and diffusion control equations. The result shows that at 30 and 50 °C, the whole leaching process is controlled by the rate balance between chemical reaction and diffusion, whereas at 70 and 90 °C, the reaction is controlled by diffusion.

Keywords: laterite, iron, hydrometallurgy, leaching, kinetic

4. Irvan Sophian, Herlinawati, Nur Khoirullah, Abdurrokhim, Iyan Haryanto and Hendarmawan

PRELIMINARY GEOMECHANICAL ANALYSIS ON LIMESTONES IN PPSDM GEOMINERBA CAMPUS, PADALARANG, WEST JAVA
ANALISIS GEOMEKANIKA AWAL PADA BATUGAMPING DI KAMPUS PPSDM GEOMINERBA, PADALARANG, JAWA BARAT

The research location is in the PPSDM Geominerba field campus. The campus is located in Padalarang, West Java that is surrounded by the open-pit mining of limestone and marble. This limestone was formed in Oligo-Miocene of Rajamandala Formation. The research objective was to determine the condition of the slopes around the campus based on geomechanical characteristics. Based on field observations, the slope angle in the area is dominated by steep slopes. The rock hardness level is dominated by hard rock with a hardness ranging from 50-100 MPa. Rock Mass Rating shows that the area is dominated by good rocks. While the Slope Mass Rating calculation show that the maximum slope angle is between 52-75°. Level of deformation and intensive weathering process will reduce the strength of the rock in the future. Several rock fall occurrences on this research area support this assumption. Yet, some local open pit mining area activity near the toe hill of the area need to be concerned regarding the effect of the local rock fall occurrences.

5. Ika Monika and Fahmi Sulistyohadi

ASH DEPOSIT CHARACTERISTIC OF BLENDED COAL IN COAL COMBUSTION PROCESS
SIFAT ENDAPAN ABU DARI PADUAN BATUBARA DALAM PROSES PEMBAKARAN BATUBARA

In coal combustion process often occurrence the problems in the reactor which is caused by fouling and slagging. One of the ways to reduce the risk of fouling and slagging by blended coal from Pendopo, Palangkaraya, Muara Enim and Samarinda, with the ratio of 25:75, 50:50, and 75:25. The ash deposit tendency is known by analyzing the composition and ash fusion temperature of coal, determining the ash type and calculating of the fouling and slagging. The results showed that the Pendopo and Palangkaraya coal with a ratio of 25:75 and 50:50 were classified as lignite with fouling and the slagging index was classified as a high and medium tendency. While the other blended coal was classified as a low and low-medium tendency.

6. Asep B. Purnama and Miftahul Huda

A PRELIMINARY STUDY OF INDONESIAN COAL BASINS FOR UNDERGROUND COAL GASIFICATION DEVELOPMENT
STUDI PENDAHULUAN CEKUNGAN BATUBARA INDONESIA UNTUK PENGEMBANGAN GASIFIKASI BATUBARA BAWAH PERMUKAAN

The energy needs in Indonesia are continuing to increase, however, the production of oil and gas declines. This problem can be minimized by developing alternative energy such as underground coal gasification (UCG) by utilizing deep seated coal at 200 to 1.000 m below surface. The objective of this study is to evaluate coal characteristic in the basins for UCG purpose depends on several coal properties such as its rank (below bituminous), thickness (5m), depth (up to 200m), and ash content plus total moisture (below 60%). Based on coal analysis of 11 coal basins from previous exploration drilling, there were several coal layers in four selected basins to be applied for the UCG project, namely 7 coal layers in South Sumatra Basin, 7 coal layers in Barito Basin, 2 coal layers in Asam-asam Basin and 5 coal layers in Kutai Basin. Based on the SNI No. 5015-2011, the coal resources was calculated and converted into a gas by a simulation procedure. Total UCG coal in South Sumatera Basin is 801 million tons, meanwhile, the Barito Basin has 436 million tons, Asam-asam 136 million tons, and Kutai 289.7 million tons. The total hypothetical syngas is 8.38 TSCF. The UCG facilities in South Sumatra Basin should be designed to produce the syngas as the natural gas within this area is in deficit condition and the basic cost for electricity supply belongs to low situation, however, the UCG plants in Kalimantan should produce electricity as its cost ratio of electricity is high and this area retains surplus natural gas supply.

7. Yuhelda, Dessy Amalia, Putri D. Novianti and Erlina Yustanti

PURUFICATION OF PREGNANT SOLUTION RESULTED FROM SPHALERITE CONCENTRATE EXTRACTION USING SULFATE ACID FOR ZINC OXYDE PRODUCTION
PEMURNIAN LARUTAN KAYA HASIL EKSTRAKSI KONSENTRAT SFALERIT DENGAN ASAM SULFAT UNTUK PEMBUATAN SENG OKSIDA

Purification of pregnant solution from sphalerite concentrate extraction using sulfate acid to produce zinc oxide was meant to prepare zinc oxide production technology utilizing existing internal sphalerite mineral raw material. The pregnant solution used to produce zinc oxide contains 29.84% zinc (Zn), with the biggest impurities iron (Fe) 11.68%. In order to obtain high purity zinc oxide, the pregnant solution should be recovered. It was done through a solvent extraction method, in two process steps: extraction and stripping. The extraction was applying ligan bis di2ethylhexyle phosphate acid (D2EHPA) in toluene solvent, through ligan concentrate variation, pH and comparison of aqueous volume with organic volume (V_A:Vo) and its excess. Stripping was carried out using sulfate acid through variation of concentration, pH and Vo:V_A. To obtain optimum recovery, thus extraction and stripping should be carried out in many steps. The extractions and the strippings were calculated using McCabe Thiele diagram. Furthermore, zinc oxide was resulted from deposition and calcination of pure pregnant solution at temperature 500°C. Purification results show that the best extraction occurred at concentration D2EHPA 1 M, pH 3 and Vo:Va 2:1, through 4 step processes obtained recovery 97.50% with distribution coefficient 77.9; while the best stripping was obtained at H_2SO_4 concentration 2 M, V_O:V_A 2:1 through 3 step processes which obtained stripping percent 98.22% with stripping coefficient 1.51. On the other hand, zinc oxide solution resulted from purification was obtained Zn 93.31% in the form of hexagonal crystals (wurtzite).

8. Nuryadi Saleh and Siti Rochani

STUDY ON REDUCTION OF IRON ORE CONCENTRATE IN ROTARY KILN TO PRODUCE DIRECT REDUCED IRON
STUDI REDUKSI KONSENTRAT BIJIH BESI DALAM TUNGKU PUTAR MENGHASILKAN DIRECT REDUCED IRON

A direct reduced iron (DRI) was prepared using iron concentrate pellets and a coal as a reductant through three stages, namely, the first: iron concentrate pellets were dried by slow heating at 150°C to remove water content, the second: they were heated at 1,200°C to reduce magnetite into hematite which was treated in two different conditions, namely by oxygen and without oxygen injections; and the third: they were reduced in an atmosphere of CO/CO_2 at various temperatures of 950-1,200°C. In this reduction process of iron oxide would be reduced by CO to metallic iron (Fe). The experimental results showed that the metallization without oxygen injection produced the best metallization at 1,100°C and the ratio of carbon/iron (FC/Fe) of 0.52 to result 84.54%, contained 74.68% Fe and 88.34% Fe_{total}. The metallization by oxygen injection produced the best metallization at 1,100°C, providing result of 96.81%, Fe_{metal} of 87.88% and 90.78% of Fe_{total}. The iron oxides on the DRI were relatively low, namely 2.9%. In this research, prior pellets preparation a magnetic oxidation process on iron ore concentrate was also conducted and changed the magnetite into hematite. The reduction process on its pellets produced 94.15% metallization at 1,100°C, and the DRI contained 97.85% of Fe_{total}, 85.32% of Fe_{metal} and 5.35% of Fe oxides. Furthermore, analyzing a remained carbon of the DRI using microscopy to seek the metal structure formed. The remained carbon was reported around 1-6% C. Next smelting process, it is suggested to have a high residual carbon concentration as there will be a carbon boil mechanism to reduce iron oxides that are still lagging on the DRI.

9. Sapta Rianda, Dedy Yaskuri and M. Ade A. Efendi

LOW-RANK COAL GASIFICATION USING BUBBLING FLUIDIZED BED REACTOR AT LOW OPERATING TEMPERATURE
GASIFIKASI BATUBARA PERINGKAT RENDAH MENGGUNAKAN REAKTOR BUBBLING FLUIDIZED BED PADA SUHU RENDAH

Coal gasification is one of coal utilizations that produces less CO_2 emission than coal combustion. Coal gasification technology that has been used in Indonesia is generally a fixed bed gasification. Fixed bed is designed for high-rank coal and the majority of Indonesian coal is of a low-rank. Low ash and high moisture content of the Indonesian coal in a fixed bed can affect mechanical and thermal fragmentation, pressure drop, gas and particle flow distribution. The operation of gasifier may cause unstable condition. Another gasification technology is bubbling fluidized bed, which is operated above 1,200°C, so ash can melt. High operating temperature causes agglomeration and makes unstable gasification process. Therefore, in this study, low-rank coal is gasified in bubbling fluidized bed reactor at low operating temperature. The purpose of this study is to determine the optimal conditions of bubbling fluidized bed gasification. The research was conducted in bubbling fluidized bed coal gasification Process Development Unit (PDU) at Coal Utilization Technology Centre of R&D Centre of *tek*MIRA, Palimanan. Coal was fed continuously as many as 20 kg/hour into a gasifier then was gasified to produce gas using air as a gasifying agent and silica sand as a bed material at 850- 950°C. The produced gas from the gasification was analyzed using the Orsat Analyzer. A simulation using a ChemCAD 7.1 CC steady state was applied to validate the experiment result. From the analyzed result of yield gas composition, the produced CO and CO_2 were about 10-15 wt%. Gas compositions that are close to criteria of producer gas, no agglomeration, and stable process condition during study indicate that bubbling fluidized bed gasification at low operating temperature is suitable to be applied as gasification technology for Indonesian low-rank coal.

Keywords: low-rank coal, gasification, bubbling fluidized bed, producer gas

10. Gandhi K. Hudaya and Nendaryono Madiutomo

THE AVAILABILITY OF INDONESIAN COAL TO MEET THE 2050 DEMAND
KETERSEDIAAN BATUBARA INDONESIA UNTUK MEMENUHI PERMINTAAN TAHUN 2050

Coal is an important energy source for industry and power plant in Indonesia. Its reserve is quite abundant around 28.5 billion tons. The Government of Indonesia issued the National Energy Policy (NEP) to target 25% of coal use of the national energy mix in 2050. The NEP directs national energy management for the provision and utilization of primary energy. However, there are worries about the ability of coal reserves in accommodating the demand from domestic and export needs. The National Energy Council recommended a coal production restriction policy for anticipation measures. This research investigated the current state of the coal reserves and the government policy to meet the target in 2050 using Vensim program. In the Vensim, a model was built to represent a coal supply-demand system. Several scenarios were simulated to analyze the relationship between government policy and the coal reserve. The result shows that government intervention such as coal production restriction policy is needed to ensure Indonesia's coal reserve can fulfill domestic demand for power generation and industry by 2050.

Keywords: coal supply demand, government policy, dynamic system

11. Triswan Suseno, Meitha Suciyanti and Nendaryono Madiutomo

ANALYSIS OF THE LINKAGE OF METALS MINING SECTOR WITH NATIONAL ECONOMIC
ANALISIS KETERKAITAN SEKTOR PERTAMBANGAN MINERAL LOGAM TERHADAP PEREKONOMIAN NASIONAL

Metals mining is one of the sectors that drives the national economy, and produced to meet the needs of human life. Almost all industries need this sector as an Metals mining is one of the sectors that drives the national economy, and produced to meet the needs of human life. Almost all industries need this sector as an input either directly or indirectly. Each creation of the output from this sector requires an input from many other industries. The role of this sector can be traced by calculating its spreading

(downstream linkages) and its degree of sensitivity (upstream linkages) of any other sectors in the country. The data used for supporting this calculation comes from trade transactions among sectors that have been compiled into Indonesian input-output tables. The objective of this study is to find the impact of metals mining sector on the regional economy. The method is conducted through approach of input-output analysis. Based on the calculation using input-output table analysis, it appears that there are four sectors that almost all its domestic outputs are able to fulfill the needs of other sectors in the country, i.e. tin-, gold-, silver- and other metals processing sectors. In other words, these four sectors have a high downstream linkage to other sectors in the country. The upstream linkages of these four sectors are also quite large because almost all other sectors in the country utilize the products of these sectors, either directly or indirectly. While the output of copper processing sector is almost entirely for exports. It indicates that the other industries in the country have not been able to capitalize this sector products due to various constraints such as technologies and investment in the processing and purification. This means that the copper mining sector has a low downstream linkage to the other sectors in the country, while the upstream linkage of this sector is very small, as the sector does not much utilize the product from other available in the country for the production process. The four sectors are more impactful since they have a high level of upstream and downstream linkages to the other industry sectors in the country compared to the copper mining sector.

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