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Abstract Index

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Application of Multi-Array Electrical Resistivity Tomography in PT. Bukit Baiduri Energi Coal Mining-East Kalimantan

Penerapan Multikonfigurasi Tomografi Tahanan Jenis pada Tambang Batubara PT. Bukit Baiduri Energi-Kalimantan Timur

IMJ, Vol. 21, No. 1, April 2018,
P. 1 - 7

Multi-array Electrical Resistivity Tomography survey was conducted in coal mining concession of PT. Bukit Baiduri Energi at the Marandai pit, Loa Janan District, Kutai Kartanegara-East Kalimantan. Data acquisition has been done using the MAE-X612 unit with 48 electrodes and 5 meters interval and the maximum length of the survey was 235 meters. The aim of the survey is to analyze resistivity images from three different electrodes configurations for interpreting coal seams and other lithologies. We deployed three configurations, including Wenner-Schlumberger, Dipole-Dipole, and Pole-Dipole in one traverse. The resistivity images analyses were constrained using geological and geophysical logging. The result shows that the Wenner-Schlumberger array is the reliable result comparing to the dipole-dipole and pole-dipole arrays. This technique will apply for further assessment to provide the reliable result in this coal mining concession. Electrical Resistivity Tomography offers rapid mapping for shallow mine working up to 45-meter depth. This method can be applied to one or two hour's measurements with 48 electrodes with maximum 5-meter electrodes interval. This method offers the possible saving of drilling cost by using resistivity profile for coal seam correlation instead of conducting more drilling.

Keywords: electrical resistivity tomography, multi-array, coal seam, lithology

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Processing of a Nigerian Columbite-Rich Ilmenite Ore for Improved Industrial Application by Sulphuric Acid Solution

Pengolahan Bijih Kolumbit-Kaya Ilmenit dari Nigeria untuk Aplikasi Industri Menggunakan Larutan Asam Sulfat

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P. 9 - 19

Due to increasing technological advancements, the demand for pure niobium products emanated from columbite ore processing has led to the wide array of its application in capacitors, nuclear uses, superconducting RF cavities, an electromagnetic radiation detector, medical devices, and aerospace among others. Therefore, this paper focuses on the kinetics of dissolution of a Nigerian Columbite mineral in sulphuric acid solution for improved industrial applications. The effects of acid concentration, reaction temperature and particle size on the ore dissolution rate were examined. Experimental results showed that the ore dissolution increases with increasing acid concentration and temperature and decreases with increasing particle size fraction. With 2 mol/L H_2SO_4 solution, 60.2% of the ore dissolved within 120 minutes using <90µm particle size at a temperature of 75^{o}C with moderate stirring (300 rpm). The unleached products were analyzed and found to contain siliceous compounds applicable as industrial by-products. The calculated activation energy (Ea) deduced to be 30.3 kJ/mol supported the proposed diffusion reaction mechanism for the first order dissolution process with a collision factor of 0.12 per minute. Hence, the dissolution data obtained in this study is an indication of thermodynamic feasibility for Nigeria Columbite ore fitness in improving science and technology for economic growth and development.

Keywords: columbite-rich ilmenite ore, leaching, sulphuric acid, dissolution kinetics, product characterization

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Thermodynamic Simulation and Validation Experiment of Neodymium Oxide Reduction Into Metallic Neodymium by Metallothermic Process

Simulasi Termodinamika dan Eksperimen Validasi Reduksi Neodimium Oksida Menjadi Logam Neodimium Menggunakan Metode Metalotermik

IMJ, Vol. 21, No. 1, April 2018,
P. 21 - 34

Neodymium (Nd) is one of the rare-earth elements (REEs) found in significant amount within monazite and bastnasite minerals. Nd is a ferromagnetic metal that is often used as a material to produce magnet, commonly known as a permanent magnet. Neodymium is alloyed with other metals such as iron and boron to form one of the strongest types of permanent magnet. This research aim is to study the reduction process of Nd-oxide into Nd-metal through the metallothermic process. The Nd metal product is expected to fulfill the material specification for a permanent magnet. Thermodynamics simulation of Nd reduction into its metal was conducted using ITB's licensed Factsage software. A validation experiment was conducted only to the Nd metal resulting simulation. The simulations involved some parameters, i.e. temperatures (600, 700, 800, 900, 1000, 1100 and 1200 °C), types of fluxes ($CaCl_2$ and $Ca(OH)_2$), composition of the reducing agent (1x, 2x dan 3x of the stoichiometric calculations), types of the reducing agents (Ca and Mg), and types of feeds used (Nd-oxide and Nd-chloride). The thermodynamic simulation shows that Nd metal was produced in a condition where the temperature should be1100-1200 °C using Ca as the reducing agent and $CaCl_2$ as the flux, while the amount of reducing agent has no effect on the resulted product. Validation result of the simulations shows that the Nd metal is formed up to 49% metal in a non-oxidative condition.

Keywords: neodymium, rare earth oxides, metallothermic, reduction, thermodynamic simulation

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Washing Test of Kendilo Coal Using a Sink-Float Method to Improve Its Quality

Studi Pencucian Batubara Kendilo Menggunakan Uji Endap-Apung untuk Meningkatkan Kualitasnya

IMJ, Vol. 21, No. 1, April 2018,
P. 35 - 44

Kendilo coal is known as a high-ash content type. Beneficiating such the coal for gasification process needs to wash the coal first. The purpose of washing is to lower the ash content until the permitted amount of about 10%. Samples for coal washing were obtained from PT. Kendilo Coal Indonesia at Pasir Belengkong, Paser Regency, East Kalimantan. The samples were taken at Bindu and Betitit Block, which containing ash of about 20%–30%. To wash the coal samples, a sink-float method was applied to test its separation characteristic. The washing process employed three sizes fraction, i.e, -12.5+5.6, -5.6+1.18, and -1.18 mm and the separation density was varied between 1.3 to 1.6 g/cc within the interval of 0.1. The liquid solutions as the separation media were made from mixing of perchloroethylene and toluene. From the coal washability curve, the best coal washing in order containing ash content of about 8% in the case of Bindu Block's coal, occurs at the fraction of -12.5+5.6 mm, at density separator of 1.36 g/cc with the recovery of 50%. While the coal of Betitit's Block, the washed coal was 50.82% at similar fraction but at different density separator of 1.39 g/cc.

Keywords: coal washability, sink and float test, recovery, coal washability curve

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Carbon Oxide Emission Factor Estimation from Indonesian Coal

Prakiraan Faktor Emisi Karbon Dioksida dari Batubara Indonesia

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P. 45 - 58

Climate change will become the priority for the air quality management. It focuses more on carbon dioxide emission. Indonesia which has power generation dominated by coal combustion is expected to develop the national CO_2 emission factor. Due to the high variation in Indonesia coal rank and its growing magnitude in CO_2 emission caused by the future coal-fired power plant development, the characteristic emission value becomes an important concern. The method used in this study is developed from the IPCC Guidelines for Energy. The conversion unit plays an important role in the calculation method. The result shows that the higher in C content, the lower in its CO_2 emission factor. It means that coal classified as high C content or high heating value will produce low carbon dioxide emission factor. The average CO_2 emission factor obtained in Indonesian coal is 99,718 kg CO_2/TJ with an average value of carbon content 27.2 kg C/GJ, and NCV equal to 19.8 TJ/Gg. Coal rank is categorized as lignite to subbituminous or bituminous.

Keywords: coal classification, climate change, emission factor, gross calorific value, net calorific value

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Supply Chain Analysis for Indonesian Nickel
Analisis Rantai Pasokan Nikel di Indonesia
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P. 59 - 75

It is imperative to increase the value-added of mineral product, especially nickel, as mandated in Law Number 4 of 2009. This law forces government and industry to optimize the added value in this country. The importing countries that perform further processing obtain most benefit from this value added. This creates an opportunity to optimize the value-added products in this country. This research aims to map supply chains along with their product flows and their relation to problem identification, to analyze product development in the supply chain, to analyze the performance of the industrial chain and its impacts on the national economy. Thus, efforts to increase the backward and forward linkages of nickel industry through value-added improvement program, as mandated in the law can be run according to plan. The research approaches were undertaken through direct and indirect surveys. From the results, there is an interrelated success between the value-added improvement policy from the Ministry of Energy and Mineral Resources and the downstreaming policy from the Ministry of Industry. This is indicated by a continuous product flow. By 2020, an estimated 71.7 million tons of nickel ore will be absorbed entirely by smelter of processing and refining in the country. Then the products generated by these smelters will be absorbed by approximately 24% by the domestic stainless steel industry. The contribution to the national economy can boost Gross Domestic Product by approximately 0.526%.

Keywords: value-added, supply chain, backward-forward linkages, economic contribution