INDONESIAN MINING JOURNAL

pISSN 0854 – 9931; eISSN 2527 – 8797 **Volume 21, No. 2, October 2018**

Abstract Index

DOI: 10.30556/imj.Vol21.No2.2018.941

Huda, Miftahul (R&D Centre for Mineral and Coal Technology)

Cement Material Development Used for Cementing Underground Coal Gasification Well

Pengembangan Semen untuk Penyemenan Sumur Gasifikasi Batubara Bawah Tanah

IMJ, Vol. 21, No. 2, October 2018,
P. 77-88

R&D Centre for Mineral and Coal Technology, the Ministry of Energy and Mineral Resources developes an underground coal gasification (UCG) technology including its UCG test in a coal mine at Musi Banyuasin regency, South Sumatra. The UCG is safer than the underground mine since there is no worker underground however there is a concern in risk of ground water pollution. One of the mthods to reduce the risk is a proper instalation of well casing and cementing that seal aquifer from contact with UCG product gas. Development of special cement for cementing UCG well is needed due to its high process temperature (up to 1300°C). The objective of this research is to develop a cement material that can withstand high temperatures environtment. Domestically available an oil well cement (OWC) and a castables (CT) were used for the experiments. Single material of OWC is not suitable for cementing UCG well since the OWC compressive strength reduced drastically at heat treatment above 300°C due to decomposistion of portlandite and calcium silicate hydrate. On the other hand, there was a synergistic effect that resulted of higher compressive strength sample if 60% weight of OWC and 40% weight of CT was blended. The absence of portlandite and the presence of inert filler materials in the blend is believed to improve thermal and mechanical properties of the blend.

Keywords: underground coal gasification, oil well cement, castables, heat treatment

DOI: 10.30556/imj.Vol21.No2.2018.677

Anugrah, Rezky I.; Amalia, Dessy and Mubarok, M. Zaki (R&D Centre for Mineral and Coal Technology; Bandung Institute of Technology-ITB)

Parameters That Affect the Dissolution of Indonesian Galena Concentrate in Fluorosilicic Acid and Hydrogen Peroxide

Parameter-parameter yang Memengaruhi Pelarutan Konsentrat Galena Indonesia dalam Larutan Asam Fluorosilikat dan Hidrogen Peroksida

IMJ, Vol. 21, No. 2, October 2018,
P. 89-97

Pyrometallurgical process still dominates the extraction of galena concentrates. The process used to extract the lead includes reduction smelting in a blast furnace, air flash smelting (Boliden process), oxygen flash smelting (Kivcet, Boliden Kaldo, Outokumpu), air-slag bath smelting (Isasmelt) and oxygen-slag bath smelting (QSL). However, those generate dust, SO_2 gas and volatile Pb liquid. As a result, such processes are ineffective to treat the complex sulfides and low-grade flotation con concentrates. Referring to the lack of high-grade lead ore the lead pyrometallurgical is a problem in the future. In addition, the environmental regulation becomes very strict lately. Those pushes the metallurgist to seek the alternative process that are environmentally friendly and able to treat the low-grade concentrates. Lead extraction through hydrometallurgical process is considered to be safer as the process do not produce dust, SO_2 gas and lead vapor.Researches for lead extraction through hydrometallurgical routes have been performed using various leaching agents such as acetic acid, ferric methanesulfonate, ferric chloride, ferric fluorosilicate and nitric acid with hydrogen peroxide and ferric ion as the oxidants. So far, no lead plant operates hydrometallurgically in an industrial scale. Fluorosilicic acid has a potential to be used as the leaching reagent for concentrating the lead because of high lead solubility in this solution and cheaper price of the reagent in compared to sulfamate and fluoroborate solutions. This research used galena concentrates from a mining area in Bogor, Indonesia, fluorosilicic acid and hydrogen peroxide as the oxidants. The highest Pb extraction percentage of 99.26% was achieved from the leaching experiment using 3.44 M of H_2SiF_6 and 9.79 M of H_2O_2, at 97^oC and concentrate particle size distribution of -100+150 mesh after 135 minutes. The XRD analysis of the leaching residue with no oxidant showed the presence of galena, sphalerite and chalcopyrite, while the residue of the leaching with oxidant showed anglesite ($PbSO_4$), galena, sphalerite, sulphur and pyrite. Lead extractions were increased by the increase of temperature and concentration of fluorosilicic acid. The best solid percentage that gave the highest lead extraction percentage was 12%. Variations of rotation speeds at the range of 300-700 rpm did not significantly influence lead extraction percentage. However, the particle size distribution that resulted in the best extraction percentage of lead is 100+150#, at which the finer particle size of the concentrate give a lower extraction percentage of the lead due to $PbSO_4$ precipitation.

Keywords: galena concentrate, leaching, fluorosilicic acid, extraction

DOI: 10.30556/imj.Vol21.No2.2018.698
Amalia, Dessy; Wahyudi, Tatang and Dahlan, Yuhelda (R&D Centre for Mineral and Coal Technology)
The Natures of Zinc Sulfide Concentrates and Its Behavior After Roasting Process
Karakter Konsentrat Seng Sulfida dan Perubahannya Setelah Proses Pemanggangan
IMJ, Vol. 21, No. 2, October 2018,
P. 99-112

The sample used for this study was a sulfide flotation concentrate that came from PT Lumbung Mineral Sentosa. The phase changes that occur in the particles of zinc sulfide concentrate during roasting in a muffle furnace were investigated using light microscopy, X-ray diffraction (XRD), and Scanning Electron Microscopy (SEM) with Energy Dispersive Spectroscopy (EDS) while its chemical composition was analyzed using atomic absorption spectroscopy (AAS) and X-ray fluorescence (XRF) methods. Characterization also employed DTA-TGA instrument to provide data on the transformations that have occurred while the TGA data presents information about physical and chemical phenomena. Mineral composition of the sample included sphalerite, galena, chalcopyrite, and pyrite. Sphalerite was the most dominant one. Roasting sphalerite samples was intended to release the sulfur from its sulfide, Such a release was made easier for further treatment of the zinc such as a leaching process. Roasting temperature varied from 200-1,100°C. Sphalerite starts to change when the temperature was raised to 650 °C performing the formation of zincite, franklinite, quartz, and sphalerite as well. This composition did not change although the temperature increased to 1,100 °C. The Zn content within the original sample was 59.00% and then increased with the increasing of temperature but the improved in line with the increased temperature. The highest Zn was 78.98% achieved at 1,100°C.

Keywords: concentrate, zinc sulfide, sphalerite, galena, chalcopyrite

DOI: 10.30556/imj.Vol21.No2.2018.967
Suganal (R & D Centre for Mineral and Coal Technology)
Rare Earth Elements Enrichment of Fixed-Bed Coal Ash from a Pilot Plant Gasification by Physical Methods
Peningkatan Kandungan Logam Tanah Jarang (LTJ) Abu Batubara Sistem Unggun Diam Skala* Pilot Plant *Menggunakan Metode Secara Fisik
IMJ, Vol. 21, No. 2, October 2018,
P. 113-125

Research and development regarding coal gasification at a pilot scale in Palimanan has been conducted since 2008. Besides the gas product, attention on chemical element identification within the bottom ash is also necessary. The aim is to implement the research and development activities in integrating coal utilization processes by zero waste. The most important content within the coal ash is the precious metal elements, namely the rare earth elements. Characterization on the fixed bed gasification coal ash from Palimanan pilot plant shows that the ash contains the rare earth elements (REE) such as cerium, lanthanum, samarium, neodymium, praseodymium, euporium, gadolinium, dysprosium, and yttrium. Its bearing minerals include zircon silicate minerals ($ZrSiO_4$) and monazite-Ce ($CePO_4$). The total content of the rare earth elements is 77.85 ppm. In this work, the rare earth elements concentration successfully increased using shaking table and magnetic separator methods. It reached up to 217 ppm. However, the shaking table was more effective to increase the concentration. Approximately two times concentrates were achieved, while no significant results derived from the magnetic separator process.

Keywords: coal ash, gasification, rare earth elements, monazite, shaking table

DOI: 10.30556/imj.Vol21.No2.2018.919
Umar, Datin F.; Shimojo, Mikio and Madiutomo, R. M. Nendaryono (R&D Centre for Mineral and Coal Technology; JGC Corporation)
Evaluation of Combustion Behaviour for Indonesian Low-Rank Coals Treated Hydrothermally
Evaluasi Perilaku Pembakaran Batubara Peringkat Rendah Indonesia yang Telah Diproses Secara Hidrotermal
IMJ, Vol. 21, No. 2, October 2018,
P. 127-139

Hydrothermal dewatering process has been made to produce dry-processed coals, which are comparable to bituminous coal. Two types of coals, i.e. low rank and high-rank coals. The low-rank coal came from West Papua while the high one was from Central Kalimantan. The behaviour of raw and processed coals were observed using thermogravimetry and differential scanning calorimetry techniques The change in chemical properties that are based on proximate, ultimate, calorific value and Fourier-transform infrared spectroscopy analyses are studied. Those are closely related to some combustion problems. This process was conducted in a laboratory scale using an autoclave with 5,000 ml/batch in capacity at the temperature of 300 and 330°C for one hour. The results indicate that the processed coals generally have a better combustion behaviour than that of the raw coals. The processed coals have a lower reactivity than that of raw ones, due to the higher ignition temperature (Tig), char burnout temperature (Tbo) as the end of combustion and maximum combustion rate (Rmax) of processed coals. The processing temperature of the process was a slight effect on combustion behaviour. The process is very effective to improve the quality of low-rank coal, nonetheless to high-rank coal, which has low moisture content and high calorific value, and the combustion behaviour of processed coals was not significantly changed.

Keywords: calorific value, high-rank coal, hydrothermal dewatering, ignition temperature, low-rank coal

DOI: 10.30556/imj.Vol21.No2.2018.972
Damayanti, Retno (R&D Centre for Mineral and Coal Technology)
Study on Environmental Quality and Hazard Identification of Underground Coal Gasification Project: A Literature Study and Field Survey
Kajian Kualitas dan Identifikasi Bahaya Lingkungan Pengembangan Gasifikasi Batubara Bawah Tanah: Tinjauan Literatur dan Survei di Lapangan
IMJ, Vol. 21, No. 2, October 2018,
P. 141-161

Underground coal gasification (UCG) is a procedure to extract synthesis gas (syngas) from the in situ underground coal seams that could not be extracted by conventional mining methods. This is a clean technology as an alternative method for direct in situ coal conversion. This process involves some heavy equipment and complex operation. Hazards identification and risk assessment in the UCG Project involve identifying the environmental hazards that cover physical, chemical and biological environments to predict the process sequences, its frequency as well as consequences that lead to those hazards. The assignment of risk level is also conducted to design corrective action in minimizing the risk or eliminating the hazards. The environmental condition of the project plan is generally good with the fulfillment of the established environmental quality standards.

Keywords: underground coal gasification, risk, hazard identification, risk assessment