PENGARUH *LEACHING* ASAM KLORIDA PADA PEMUNGUTAN LOGAM TANAH JARANG DARI ABU LAYANG BATU BARA PLTU TIPE *FLUIDIZED BED COMBUSTION*

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INTISARI

Permintaan global terhadap Logam Tanah Jarang (LTJ) terus meningkat, tetapi sumber primer LTJ mengalami keterbatasan dan tantangan. Pemanfaatan abu layang batu bara yang mengandung LTJ menjadi solusi efektif. Analisis efisiensi pemungutan LTJ dari abu layang yang dihasilkan PLTU tipe *fluidized bed combustion* dengan metode *direct leaching* menjadi fokus penelitian.

Mineralogi abu layang dianalisis dengan *X-Ray Diffraction* (XRD). Metode *direct leaching* digunakan dalam pemungutan LTJ. Konsentrasi larutan HCl dan suhu *leaching* menjadi variabel proses yang divariasikan dengan rentang berturut-turut 2 hingga 6 M dan 60 hingga 85℃. Proses *leaching* dilakukan selama 120 menit dengan laju pengadukan 400 rpm dan rasio *liquid/solid* 10 mL/gr. Kadar LTJ pada filtrat hasil *leaching* dianalisis dengan *Inductively Coupled Plasma - Optical Emission Spectrometry* (ICP-OES). Efisiensi *leaching* LTJ ditentukan pada tiap variasi. *Central Composite Design Response Surface Methodology* (CCD RSM) digunakan untuk memprediksi kondisi optimal variabel proses agar menghasilkan efisiensi maksimum.

Berdasarkan hasil *response optimizer*, kondisi optimal untuk proses *direct leaching* tercapai pada konsentrasi larutan HCl 4,37 M dan suhu *leaching* 65,53℃. Adapun efisiensi pemungutan LTJ maksimum diprediksi sebesar 23,83%. Konsentrasi dan suhu secara bersama memberi pengaruh signifikan terhadap efisiensi pemungutan LTJ. Pemungutan LTJ menurun setelah mencapai kondisi optimal, karena sebagian LTJ masih terperangkap dalam *amorphous*, *quartz*, dan *mullite*, serta endapan padat.

Kata kunci: Logam Tanah Jarang, abu layang, *direct leaching*, HCl
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EFFECT OF HYDROCHLORIC ACID LEACHING ON THE RECOVERY OF RARE EARTH ELEMENTS FROM COAL FLY ASH OF FLUIDIZED BED COMBUSTION TYPE POWER PLANT

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ABSTRACT

The global demand for Rare Earth Elements (REE) continues to increase, but primary sources of REE face limitations and challenges. Utilisation of coal fly ash containing REE is an effective solution. Analysis of REE recovery efficiency from fly ash produced by fluidized bed coal power plant using direct leaching method is the focus of the research.

The mineralogy of fly ash was analysed by X-Ray Diffraction (XRD). The direct leaching method was used on REE recovery. HCl solution concentration and leaching temperature were the process variables varied with a range of 2 to 6 M and 60 to 85℃ respectively. The leaching process was carried out for 120 minutes with a stirring rate of 400 rpm and a liquid/solid ratio of 10 mL/gr. The REE content in the leached filtrate was analysed by Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES). The REE leaching efficiency was determined for each variation. Central Composite Design Response Surface Methodology (CCD RSM) was used to predict the optimal conditions for the process variables to produce maximum efficiency.

Based on response optimizer results, the optimal conditions for the direct leaching process were reached at HCl solution concentration of 4.37 M and a leaching temperature of 65.53℃. The maximum REE recovery efficiency was predicted at 23.83%. Concentration and temperature together have a significant effect on REE recovery efficiency. REE recovery decreased after reaching the optimum conditions, because some REE was still trapped in amorphous, quartz, and mullite, as well as solid precipitates.

Keywords: *Rare Earth Elements, fly ash, direct leaching,* HCl
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