Pengaruh aditif dan temperatur reduksi terhadap peningkatan kadar dan recovery nikel melalui proses reduksi selektif bijih nikel laterit menggunakan reduktor arang cangkang sawit = Effect of different additives and reduction temperature on grade and recovery of nickel by selective reduction of nickel laterite ore used palm kernel shell charcoal as reductant

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Abstrak

Pengolahan bijih nikel laterit untuk menghasilkan feronikel memerlukan konsumsi energi yang tinggi. Sehingga perlu teknik pengolahan bijih nikel laterit terutama yang berkadar rendah agar tetap ekonomis. Reduksi selektif bijih nikel laterit diaggap sebagai proses yang potensial untuk menghasilkan nikel berkadar tinggi pada feronikel. Reduksi selektif terjadi karena penambahan sejumlah aditif pada bijih nikel laterit kemudian dilakukan separasi magnetik. Pada penelitian ini, digunakan aditif natrium karbonat, natrium klorida dan natrium sulfat serta 5 arang cangkang sawit sebagai reduktor. Reduksi dilakukan pada variasi temperatur 950, 1050 dan 1150 oC selama 60 menit. Kemudian dilakukan metode separasi magnetik basah dengan kekuatan magnet 500 Gauss untuk memisahkan konsentrat yang bersifat magnetik dan tailing. Karakterisasi bijih laterit hasil reduksi dilakukan menggunakan X-ray Diffraction XRD , mikroskop optik dan Scanning Electron Microscope SEM yang dilengkapi Energy Dispersive X-ray Spectroscopy EDS serta konsentrat feronikel dan tailing diidentifikasi menggunakan X-ray Fluororescene XRF.
Hasil percobaan menunjukkan bahwa penambahan aditif menghasilkan peningkatan kadar dan recovery nikel serta recovery besi pada konsentrat jika dibandingkan dengan bijih reduksi tanpa penambahan aditif. Penambahan 15 aditif natrium sulfat dapat meningkatkan kadar dan recovery nikel hingga mencapai 5,3 dan 83,7 pada temperatur reduksi 1150 oC selama 60 menit. Pada penambahan 5 aditif natrium karbonat dan natrium klorida menghasilkan recovery nikel optimum sebesar 73,1 dan 72,8. Peningkatan temperatur reduksi hingga 1150 oC selama 60 menit berpotensi meningkatkan ukuran partikel feronikel, dengan penambahan dosis 10 natrium sulfat, natrium karbonat dan natrium klorida dihasilkan rata-rata ukuran partikel feronikel sebesar 30,6 mm, 12,8 mm dan 8,0 mm hingga 30,6 mm. Partikel feronikel mengalami aglomerasi seiring dengan peningkatan temperatur pada penambahan aditif yang memberikan kondisi yang menguntungkan untuk migrasi dan agregasi Ni dan Fe.
<hr><i>The processing of nickel laterite to produce ferronickel requires high energy consumption. Therefore, it needs low cost technology in mineral processing the low grade nickel laterite to keep it economically. Selective reduction of nickel laterite ore is a potential method for producing high grade ferronickel. Selective reduction is performed due to the addition of additives to lateritic nickel ore and followed by magnetic separation. In this study, the additives were sodium carbonate, sodium chloride and sodium sulphate and 5 palm shell charcoal were used as reducing agents. The temperature reduction was carried out at 950 and 1150 oC for 60 min. Magnetic separation used in this study was a wet magnetic separation with 500 Gauss and the magnetic product magnetic product that was resulted from the magnetic separation was ferronickel concentrate. The characterization of reduced ore was performed by using by X ray Diffraction XRD , optical microscope and Scanning Electron Microscope SEM with Energy Dispersive

X ray Spectroscopy EDS and ferronickel concentrate was identified by X ray Fluororescene XRF.
The results showed that the addition of additives was significantly affected to the increasing of nickel grade, nickel recovery and iron recovery at concentrate than the reduced ores without additives. When the sodium sulfate dosage was increased to 15 at 1150 oC for 60 min, the nickel grade and nickel recovery were increased to 5.3 and 83.7 , respectively. By the increasing of the addition of sodium carbonate and sodium chloride up to 5 , the yielded optimum nickel recovery was 73.1 and 72.8 , respectively. The increasing of reduction temperature to 1150 oC for 60 min potentially increased the particle size of ferronickel up to 30.6 m by the addition of a 10 sodium sulfate. In the presence of sodium carbonate and sodium chloride result on the average of ferronickel particle size approximately 12.8 and 8.0 m, respectively. The ferronickel particle was agglomerated with increasing reduction temperature and addition additives and it provides favorable conditions for the migration and aggregation of Ni and Fe.</i>