

Peningkatan kadar mangan dan rasio mangan/besi dari bijih mangan kadar rendah lokal melalui proses benefisiasi dengan variasi waktu reductio roasting = Enhancement of mn fe ratio from local low grade manganese ore through beneficiation with reduction roasting time as a variant

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Abstrak

Mangan merupakan logam ke empat yang paling banyak digunakan di dunia setelah baja, aluminium dan tembaga. Sekitar 95% mangan digunakan untuk kebutuhan metalurgi, yaitu untuk steelmaking dan pembuatan ferroalloys seperti silico-manganese dan ferromanganese. Mangan dapat dikategorikan berdasarkan kandungannya, yaitu bijih mangan kadar rendah (kurang dari 30% Mn), sedang (30%-40% Mn) dan tinggi (lebih dari 40% Mn). Pembuatan ferromangan dengan kadar Mn minimum 60% menggunakan bijih mangan kadar rendah sangat sulit, oleh karena itu perlu dilakukan proses benefisiasi untuk meningkatkan kadar bijih Mn serta rasio Mn/Fe.

Dalam penelitian ini telah dilakukan proses benefisiasi terhadap dua jenis bijih mangan lokal, yaitu bijih mangan asal Lampung dan Jawa Timur. Benefisiasi dimulai dengan crushing dan grinding dua bijih mangan, untuk mereduksi ukuran partikel. Pengaruh ukuran partikel, yaitu -20+40, -40+60 dan -60+80 mesh terhadap proses benefisiasi telah dipelajari dalam penelitian ini. Proses benefisiasi berupa gravity separation dengan menggunakan metode shaking table dilakukan terhadap kedua jenis bijih mangan tersebut. Preliminary test dilakukan setelah gravity separation untuk mengetahui feasibility dari kedua bijih mangan tersebut untuk dilakukan proses benefisiasi tahap selanjutnya, yaitu reduction roasting. Reduction roasting dilakukan terhadap bijih mangan pada suhu 700oC dengan variasi waktu 1 jam, 1,5 jam dan 2 jam. Magnetic separation dilakukan terhadap masing-masing variasi waktu menggunakan magnet dengan kekuatan sekitar 500G.

Hasil yang didapat menunjukkan bahwa ukuran partikel tidak terlalu mempengaruhi rasio Mn/Fe. Kemudian hasil dari gravity separation menunjukkan proses ini tidak efisien terhadap kedua bijih mangan. Pada bijih mangan asal Lampung tidak ada kenaikan rasio Mn/Fe yang signifikan, lalu pada bijih mangan asal Jawa Timur rasio Mn/Fe naik menjadi 3,3 pada fraksi tailing, namun tailing yang didapat hanya sekitar 2,4% dari feed yang masuk sehingga menyebabkan proses ini tidak ekonomis. Reduction roasting memiliki efek yang penting untuk proses magnetic separation karena dapat mengubah senyawa hematite menjadi magnetite sehingga Fe pada bijih mangan dapat terpisah. Hasil magnetic separation menunjukkan rasio Mn/Fe paling tinggi didapat dalam waktu 1 jam pada ukuran -20+40, yaitu sebesar 6,10 dan menurun seiring semakin halusya ukuran partikel.

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Manganese is the fourth widely used metal in the world after steel, aluminium and copper. For about 95% of Manganese usage is for metallurgical applications, like steelmaking and the productions of ferroalloys, silico-manganese and ferromanganese. Manganese is categorized based on its content, which is low-grade (less than 30% of Mn), medium-grade (30-40% of Mn) and high-grade (more than 40% of Mn). Producing ferromanganese with a minimum content of Mn for about 60% using a low-grade manganese ore is very

difficult, therefore beneficiation process is needed to enhance the Mn content and also the Mn/Fe ratio. In this research, beneficiation processes were conducted to two local low-grade manganese ores, manganese ore from Lampung Province and from East Java Province. Beneficiation starts by crushing and grinding two manganese ores, to reduce the particle size. The effect of particle sizes, which were -20+40, -40+60 dan -60+80 mesh, to the beneficiation processes were studied in this research. Gravity separation using shaking table as a method was the first step of beneficiation process that was conducted to both manganese ores. Preliminary test were done after the gravity separation to understand the feasibility of the two manganese ores that can be processed to the next beneficiation processes, reduction roasting. Reduction roasting was conducted to the manganese ore in 700°C for 1 hour, 1,5 hours and 2 hours as a time variant. Magnetic separation was done by separating every single time variant using a magnet with an intensity about 500G. The results shows that size fraction or particle size has a negligible effect to the Mn/Fe ratio. The gravity separation results shows that this process is not efficient to the both manganese ores. Lampung Province ore shows that there is no significant of Mn/Fe increment, and for East Java Province ore, Mn/Fe increases to 3.3 in tailing fraction, however the tailing fraction that is gained in this process was only about 2.4% from the feed therefore it's not economical. Reduction roasting has an important effect for the magnetic separation process because it converts hematite compound to magnetite so the Fe from this ore can be separated. The magnetic separation results shows that the highest Mn/Fe ratio was gained in 1 hour on -20+40 size particle, which is 6.10 and decrease along with decreasing the size particle.