Peningkatan kadar dan rasio mangan pada bijih mangan lokal kadar rendah melalui proses benefisiasi dengan variabel temperatur pada reduction roasting = The enhancement of manganese grade and its ratio from local low grade manganese ore through beneficiation process with the variation of temperature on reduction roasting process

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Abstrak

ABSTRAK
Sekitar 90% bijih mangan di dunia digunakan untuk pembuatan ferromangan dan ferrosilicomangan sebagai material paduan dalam proses steel making. Penambahan unsur mangan dalam wujud paduan ferromangan pada proses steel making mampu meningkatkan kekerasan dan ketangguhan baja. Ferromangan diperoleh dari pengolahan bijih mangan metallurgical grade dengan proses peleburan. Bijih mangan kadar rendah, melalui penelitian sebelumnya oleh Hendri (2015) dan Noegroho (2016), tidak ekonomis untuk dilebur menjadi ferromangan
􀁇􀁈􀁑􀁊􀁄􀁑􀀃􀀰􀁑􀀃􀂕􀀙􀀓􀀈􀀃􀁖􀁈􀁋􀁌􀁑􀁊􀁊􀁄􀀃􀁅􀁌􀁍􀁌􀁋􀀃
mangan kadar rendah harus dibenefisiasi terlebih dahulu untuk meningkatkan kadar mangan dan rasio Mn/Fe dalam bijih.
Bijih mangan kadar rendah pada penelitian ini merupakan bijih mangan lokal asal Lampung dan Jawa Timur. Benefisiasi dilakukan menggunakan teknik gravity separation dan reduction roasting selama 30 menit menggunakan 20% batu bara dilanjutkan magnetic separation pada medan magnet ±500 gauss. Bijih mangan dihaluskan ke dalam ukuran -20+40, -40+60, dan -60+80 mesh dan temperatur reduction roasting divariasikan pada 500oC, 700oC, dan 900oC. Pengujian XRD dan XRF dilakukan dalam mengarakterisasi sampel awal dan hasil.
Rasio Mn/Fe dan kadar mangan pada bijih asal Lampung masing-masing sebesar 0,90 dan 7,83% sementara pada bijih asal Jawa Timur masing-masing sebesar 1,356 dan 18,52%. Setelah dibenefisiasi, hasil terbaik dari proses gravity separation pada bijih Lampung tercapai pada rasio Mn/Fe 0,95 dengan kadar Mn 9,4% pada 89,75% recovery berat sementara pada bijih Jawa Timur diperoleh pada rasio Mn/Fe 3,32 dengan kadar mangan 40,48% pada 2,09% recovery berat. Selanjutnya, hasil terbaik dari reduction roasting dilanjutkan magnetic separation pada bijih Lampung diperoleh pada rasio Mn/Fe 1,96 dan kadar mangan 6,81% pada 36 wt% recovery, sementara pada bijih Jawa Timur, tercapai pada rasio Mn/Fe 3,99 dan kadar mangan 34,31% pada 44 wt% recovery.
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ABSTRACT
About 90% of manganese ore is utilized for ferromanganese and ferrosilicomanganese production as alloying metal in the steel making process. The addition of manganese in the form of ferromanganese to the steel making process is able to increase hardness and toughness of steel. Ferromanganese is obtained from the metallurgical grade manganese ore processing through the smelting process. Low grade manganese ore, according to the previous research from Hendri (2015) and Noegroho (2016), was not economic for direct smelting to obtain ferromanganese with Mn 􀂕􀀙􀀓􀀈􀀑􀀃 Therefore, low grade manganese ore must be beneficiate first to enhance the manganese grade and its ratio.

Low grade manganese ore in this research are a local ore from Lampung and East Java. The steps on the beneficiation process are including gravity separation and reduction roasting for 30 minutes using 20% of coal followed by magnetic separation at the magnetic intensity of ±500 Gauss. The particle size was reduced into -20+40, -40+60, and -60+80 mesh and the temperature of reduction roasting was varied at 500oC, 700oC, and 900oC. XRD and XRF testing was conducted for the characterization of ore and the sample results.

Mn/Fe ratio and manganese content in Lampung ore is respectively 0.9 and 7.83%, while in East Java ore is respectively 1.356 and 18.52%. After beneficiation, the best results from gravity separation of Lampung ore was obtained at 0.95 of Mn/Fe ratio and 9.4% of manganese content at 89.75% of weight recovery, while in East Java ore was obtained at 3.32 of Mn/Fe ratio and 40.48% of manganese content at 2.09% of weight recovery. Then, the best results of reduction roasting followed by magnetic separation of Lampung ore was obtained at 1.96 of Mn/Fe ratio and 6.81% of manganese content at 36% of weight recovery, while in East Java ore was obtained at 3.99 of Mn/Fe ratio and 34.31% of manganese content at 44% weight recovery.