PELINDIAN BIJIH MANGAN NUSA TENGGARA TIMUR MENGGUNAKAN CAIRAN IONIK EUTEKTIK BERBASIS ASAM LEMAK

TESIS

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Oleh:
Andika Purnama Shidiq
2217030

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LEACHING OF MANGANESE ORE FROM EAST NUSA TENGGARA USING FATTY ACID BASED EUTECTIC IONIC LIQUID

Oleh
Andika Purnama Shidiq

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HALAMAN PENGESAHAN

ANDIKA PURNAMA SHIDIQ

PELINDIAN BIJIH MANGAN NUSA TENGGARA TIMUR MENGGUNAKAN CAIRAN IONIK EUTEKTIK BERBASIS ASAM LEMAK

Disetujui dan disahkan oleh:

Pembimbing I,

Prof. Dr. rer. nat. Ahmad Mudzakir, M.Si.

NIP. 196611211991031002

Pembimbing II,

Dr. Soja Siti Fatimah, M. Si.

NIP. 196802161994022001

Mengetahui:

Ketua Program Studi,

Prof. Dr. Fitri Khoerunnisa, M.Si.

NIP. 197806282001122001

ABSTRAK

Bijih Mangan umumnya diolah menggunakan pelindian dengan bantuan pelarut asam kuat yang berdampak buruk pada lingkungan dan memiliki selektivitas logam yang rendah. Pada penelitian ini dikembangkan metode ekstraksi pada sampel bijih Mangan NTT menggunakan pelarut alternatif *Eutectic Ionic Liquids* (EILs) berbasis asam lemak yaitu betain-asam cis oleat (1:4). Optimasi pelindian dilakukan dalam berbagai parameter, seperti suhu, waktu, rasio cair/padat, dan ukuran partikel sampel. Selain itu, penggunaan kembali EILs juga diuji untuk 3 siklus pelindian. Karakterisasi mencakup analisis XRF, XRD, SEM-EDX dan FTIR. Data XRF menunjukkan sampel berkualitas tinggi dengan kandungan Mangan mencapai 87,84% (%wt). Kelarutan optimum Mangan teramati pada parameter suhu 100°C, waktu 48 jam, rasio L/S 15/1, dan ukuran partikel 0,075 mm dengan %ekstraksi Mangan mencapai 30,19%. Sedangkan, elemen lain seperti Aluminium, Silikon, dan Besi tidak terlalu terlindi sekitar <6% (%ekstraksi). Pada penggunaan kembali EILs, Mangan teramati masih stabil terekstraksi. Hal ini didukung dari adanya gugus C=O sebagai pengikat logam pada EILs berdasarkan data FTIR. Data XRD menunjukkan jenis fasa yang paling dominan adalah *phrolusite* (MnO_2) sebesar 71,4% (%wt), diikuti *gibbsite* ($Al(OH)_3$), *siderite* (Fe_2O_3), dan *Silicone* (Si). Intesitas puncak MnO_2 teramati berkurang sebelum dan setelah pelindian. Data SEM menunjukkan perubahan topologi ukuran, dari yang bervariasi dan kasar menjadi lebih homogen dan halus setelah pelindian. Persebaran logam pada hasil *mapping* EDX juga menunjukan pola yang sama di mana Mangan tersebar pada permukaan bijih.

Kata kunci: EILs, betain, asam cis-oleat, bijih Mangan, dan pelindian.

ABSTRACT

Manganese ore is generally processed using leaching with the help of strong acid solvents which have a negative impact on the environment and have low metal selectivity. In this study, an extraction method was developed on NTT Manganese ore samples using alternative solvents Eutectic Ionic Liquids (EILs) based on fatty acids, namely betaine-cis oleic acid (1:4). Leaching optimization was carried out in various parameters, such as temperature, time, liquid/solid ratio, and sample particle size. In addition, the reuse of EILs was also tested for 3 leaching cycles. Characterization includes XRF, XRD, SEM-EDX and FTIR analysis. XRF data showed high-quality samples with Manganese content reaching 87.84% (%wt). The optimum solubility of Manganese was observed at a temperature parameter of 100°C, time of 48 hours, L/S ratio of 15/1, and particle size of 0.075 mm with a % Manganese extraction reaching 30.19%. Meanwhile, other elements such as Aluminum, Silicon, and Iron are not too leached around <6% (% extraction). In the reuse of EILs, Manganese is observed to be still stable in extraction. This is supported by the presence of C=O groups as metal binders in EILs based on FTIR data. XRD data shows that the most dominant phase type is phrolusite (MnO_2) at 71.4% (%wt), followed by gibbsite ($Al(OH)_3$), siderite (Fe_2O_3), and Silicone (Si). The intensity of the MnO2 peak is observed to decrease before and after leaching. SEM data shows changes in size topology, from varied and coarse to more homogeneous and smooth after leaching. The distribution of metals in the EDX mapping results also shows the same pattern where Manganese is distributed on the ore surface.

Keywords: EILs, betaine, cis-oleic acid, Manganese ore, and leaching.

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