EXTRACTION OF IRON FROM USED BLASTING SAND

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DECLARATION

"I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

Blasting sand is used as an abrasive material for sand blasting process. In Sri Lanka blasting sand made of copper slag is used for treating the ship surfaces before painting. In a year about 6000 tons of used blasting sand is rejected as a waste. This waste is a huge problem because this sand cannot be directly dumped to the environment due to environmental pollution.

Sieve analysis, Magnetic separation, Energy dispersive X-ray analysis (EDAX) tests were done in the characterization step. According to the EDAX results average iron (Fe) amount of raw material was 36% and it was increased up to 48% after the magnetic separation. Magnetic separation results showed that there were 88% percent of magnetic materials available in the raw material. Magnetic separation test for retaining materials of sieves were showed that increase of magnetic amount with the decrease of particle size giving average 82% of magnetic percentage for particles larger than 500 microns and 98% of magnetic percentage for particles smaller than 500 microns.

Considering characterization data direct reduction method was selected as the extraction method. Best raw material mixing proportion and sintering temperature was found from the optimization process done for different pellet combinations. Pellets prepared with 100 parts of used blasting sand, 7 parts of Coke and 6 parts of Arawakkalu lime and fired in 1200^0C temperature was shown excellent results for Apparent porosity test and Crushing strength tests. The subsequent melting of these pellets in the lab scale cupola recovered iron as “metallic pigs”, which confirmed to alpha iron.

Keywords: *Blasting sand, Copper slag, Iron Extraction, Direct reduction.*

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ABBREVIATIONS

Fe_2SiO_4 – Fayalite

Fe_2O_3 – Hematite

Fe_3O_4 - Magnetite

EDAX – Energy-dispersive x - ray analysis

XRD – X-ray diffraction analysis