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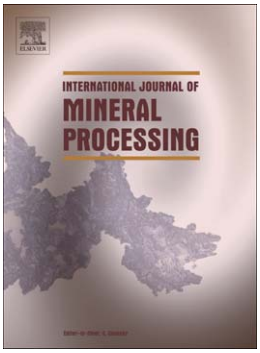

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A Novel Approach for Reduction Roasting of Iron Ore Slime using Cow Dung

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Abstract

The present study encompasses the first ever attempt of the usage of cow dung as a reductant in the reduction roasting of an Indian iron ore slime containing 56.2% Fe. The resultant reduced mass generated a concentrate of ~64% Fe with a weight recovery ~66% after being subjected to low intensity magnetic separation (LIMS). The optimum conditions of roasting as determined by the Taguchi statistical design were found to be temperature: 700º C, time: 45 min and reductant to feed ratio: 0.25:1. Under similar conditions, the conventional reductant charcoal (fixed carbon: 93.5%, volatile matter: 1.2%) could result in a product of ~66% Fe at ~35% weight recovery proving cow dung (fixed carbon: 8.66%, volatile matter: 41.27%) to be a better reductant. The cow dung cake and some of the reduced products were subjected to integrated instrumental techniques such as X-ray Diffraction (XRD), Scanning Electron Microscope attached with an Energy Dispersive Spectroscopy (SEM-EDS) and Electron Probe Micro-Analysis (EPMA), which revealed the formation of new phases such as hercynite, corundum, iron aluminium silicate along with magnetite and wustite, at different levels of operating parameters, thereby explaining the role of different reduction variables.

Key words: Iron ore slime, reduction roasting, cow dung, low intensity magnetic separation, EPMA

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