

SUITABILITY OF CHARRED CORN COB AND ITS BLENDS WITH END-OF-LIFE HIGH DENSITY POLYETHYLENE AS REDUCTANTS FOR IRON AND STEELMAKING TECHNOLOGIES

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Abstract

The Government of Ghana proposed a bill in 2019 for establishing an integrated Iron and Steel Corporation, aimed at exploiting the country's commercial iron ore resources for job creation. In this work, the potential for using waste materials as feedstock in the production of high-grade iron nuggets from the Pudo iron ore in the Upper East Region of Ghana is investigated. Carbonaceous materials generated from charred corn cob (CCC) and its blends with end-of-life high density polyethylene (HDPE) were used as reductants. Corn cob was charred and pulverised in a laboratory ball mill to $-106\ \mu\text{m}$, followed by mixing with pulverised HDPE samples. The generated carbonaceous materials were characterised by XRD, SEM/EDS and FTIR analyses. Reduction studies were conducted on composite pellets of the ore in a domestic microwave oven (AKAI brand, 2400 MW, 2.45 GHz). It was observed that iron nuggets can be produced from the Pudo iron ore using CCC, HDPE and their blends. The measured extent of reduction was up to 98.7%, attained for a CCC-HDPE blend ratio of 2:3, providing a sustainable and locally sourced path for iron nugget production aligned with Ghana's industrial development goals.

Keywords: Reduction, Pudo Iron Ore, charred corn cob, high density polyethylene, extent of reduction.

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