

Mineral Processing and Extractive Metallurgy Review

Evaluation of Ilmenite as dense medium for dry coal fluidized bed beneficiation

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Abstract

Published work on dry dense medium fluidized beds has mainly used magnetite and fine coal to make up the dense medium. Magnetite is used to achieve the required cut densities, but its recovery and reuse are problematic because it attaches to the surface of the coal and discard material, and its surfaces become contaminated. This study focused on using ilmenite (FeTiO₃) as an alternative medium in the dry dense medium fluidization process due to its favorable surface properties of hydrophilic and sphericity. The initial investigation considered a reference medium, which consisted of ilmenite and sand (used for base-case tests), and a second medium, consisting of ilmenite and fine coal, which resembled that currently used in the dry dense medium fluidized bed process. Experiments to evaluate the performance of the ilmenite were carried out in a laboratory-scale cylindrical fluidized bed. Losses of the ilmenite were investigated by mixing and recovering the ilmenite using two different coal samples of 13.2–50 mm particle size. Density tracers were used to determine the écart probable moyen (EPM). At optimal conditions, the bed media consisting of sand and fine coal with ilmenite had EPM values of 0.045 and 0.05 at cut densities of 1.8 and 1.58 g/cm³, respectively. No ilmenite losses were observed. The ilmenite surfaces contained no contaminants after 10 cycles. The highest ilmenite recovery achieved from the bed after high-intensity magnetic separation was 99.79%.