

EVALUATION OF THE DELTA STEEL COMPANY (DSC), Ovwian-ALADJA, WESTERN NIGER DELTA, NIGERIA, DIRECT REDUCTION STEELMAKING SLAG FOR USE IN THE AGGREGATES INDUSTRY

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ABSTRACT

Delta Steel Company (DSC), Ovwian-Aladja, steelmaking slag is a byproduct of the direct reduction steelmaking process. Fifteen (15) samples of the slag were subjected to practical laboratory physical/mechanical, chemical and process evaluation mainly in accordance with the BS 812 part 3 1975: 1988 Standard Specifications. The primary aim of this research was to determine the slag potentials for use as aggregate in the building, construction and transportation industries. The mean results obtained, were specific gravity (3.65), bulk density (1720kg/m^3), loss on ignition (2.29), water absorption (per cent by mass 0.02), moisture content (per cent by mass 2.29), pH(8.8), thermal expansion coefficient (vertical, $6 \times 10^{-4} \text{mV}/^\circ\text{C}$), flakiness index (FI, 25.8%); aggregate impact value (AIV 11.6), aggregate compression value (ACV 13.7), aggregate abrasion value (AAV 3.16), polished stone value (PSV 56), crushed coarse size grading were, <14mm-10mm (55.52%), <10.00mm-2.36mm (34.51%); sand grade: 2.36mm (42.19%), 2.00mm-1.00mm (40.36%), and 600.00 μm -150.00 μm (14.07%) grading; washing recovery were (100%), scrubbing recovery (sand grade 97.58%), acid recovery (10% H_2SO_4 99.34%), (10% HCl 82.80%) and that of the pickle liquid treatment showed slag attainment of maturity (aging). The mean contents of the hydratables, lime (CaO -0.40%) and magnesia (MgO - (0.01%) are low. The hydraulic properties, high particle density and hardness, irregular and angular shape, gave it large bearing capacity for use as a road base course and building material, a superior wear resistance property for asphalt concrete and for use as railroad ballast.

Keywords: Slag, direct-reduction, aggregate, physical/mechanical, maturity.