

ABSTRACT

## The Development of Ceramics from Jamaican Bauxite Waste

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Ceramics are developed from one hundred percent bauxite waste (Red Mud), a by-product of the bauxite/alumina industry in Jamaica. The raw material, pulverized to particles not greater than 75  $\mu\text{m}$  in diameter, is used to fabricate rectangular test specimens with average dimensions: (3.8 x 10.5 x 60.4)  $\text{mm}^3$ . The moulding pressure ranges from 2.34 to 9.44 MPa (340 to 1369 psi). The specimens are subjected to various firing temperatures and soaking times ranging from 1000 to 1175  $^{\circ}\text{C}$  and from 2 to 7 hours, respectively.

Measurements of mechanical properties, density, apparent porosity and volume shrinkage are carried out on the fired specimens. Scanning Electron Microscopy is used to explain the observed properties. The Fracture Toughness varies between 0.31 and 1.79  $\text{MNm}^{-3/2}$ ; Modulus of Rupture varies between 13.4 and 66.1  $\text{MNm}^{-2}$ ; Compressive Strength varies between 14.4 and 165.0  $\text{MNm}^{-2}$  and Brinell Hardness Number ranges from 24.2 to 213.2  $\text{Kg mm}^{-2}$ . Bulk Density varies between 2.09 and 3.46  $\text{gm/cm}^3$ ; Apparent Porosity varies between 1.5 and 49.8 percent and Volume Shrinkage varies from 6.6 to 45.5 percent. Effects of the addition of carbon and the porosity dependence of the fracture toughness are discussed.

The properties of the red mud ceramics developed, can be optimized by moulding the raw material at 7.6 MPa and firing the moulded product at 1150  $^{\circ}\text{C}$  for five hours.