

EXPERIMENTAL INVESTIGATION ON LOCAL REFRACTORY MATERIALS FOR FURNACE CONSTRUCTION

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ABSTRACT

The experimental investigation into the suitability of our locally available clays as refractory material for furnace construction was the major focus of this work. Four samples of clays from different location; Kuru, Alkaleri, Barkin ladi and Bauchi were analyzed. The properties investigated include, moisture content, Bulk density, Porosity, Permeability, Cold crushing strength, Thermal shock resistance and Refractoriness. From the results obtained, the Alkaleri and Barkin ladi clay samples were recommended for the construction of furnaces due to their conformity with the existing standard refractory clays, while Kuru and Bauchi clays are suitable for lining of ladles.

INTRODUCTION

In the last few years, there has been an increasing awareness on the scope, and importance of local refractory materials in the industrial development of Nigeria. To this end the country has witnessed various products coming out of plants at different parts of the country. The production in these plants is a high temperature operation, which is made feasible through the use of local refractory materials that are used to curtail and control heat and its various side effects. This is also the case with other high temperature operations such as in non-ferrous metals, glass, ceramics, cement, and power generation, oil and chemical production. (Swinden, 1994). A refractory material therefore, may be defined as one, which retains its physical shape and chemical identity when subjected to conditions of heating at high temperatures. Within the same operating plant such as in iron and steel making, a wide range of refractories are used because of their high temperature resisting physical and chemical properties. However, the main refractory compounds are based either on a single oxide as Alumina (Al_2O_3), Silica (SiO_2), Magnesia (MgO) or Zircon (ZrO_2) or on combination of any of these. (Obikwelu,

1986). Many other Nigerian researchers have presented papers on their respective research work toward refractory materials in Nigeria. Some did a combined research work on the potentials of some Nigerian clay deposits as refractory materials for the steel industries. (Aderibigbe etal, 1984). They carried out research on some samples of clays and found out that they possessed some refractory potential.

This work is aimed at investigating properties of our local refractory materials and comparing them with imported one with a view to replacing the foreign ones or improving on the local ones if need be.

Materials

The samples used in this investigation were obtained from different locations within two states: Plateau state (A and C) and Bauchi state (B and D). The samples are: A-Kuru, B-Alkaleri, C-Barkin ladi, and D-Bauchi.

The dry samples obtained were ground into powder and passed through sieves of different mesh sizes ranging from 850 μm to 1.18 mm. The samples were mixed with adequate quantity of water and then moulded into bricks using the hydraulic press, after which they were air dried for 24 hours and oven dried at a temperature of