

# P066 - INVESTIGATION ON THE EFFECT OF IRON OXIDE (FeO<sub>3</sub>) PIGMENT ON THE PRODUCTION OF COLOURED CEMENT FOR CONCRETE WORKS

J.S. Okoh\*, A.S. Kovo, P.E. Dim

*Federal University of Technology, Minna.*

Email: spensoitodo@gmail.com

## ABSTRACT

Coloured concrete has gained significant popularity in Engineering and decorative applications due to its aesthetic appeal. Iron oxide (FeO<sub>3</sub>) pigments are widely used to impart color to cement-based materials. This research work investigates the effect of FeO<sub>3</sub> pigment on the production of colored cement for concrete works. It explores the influence of FeO<sub>3</sub> pigment on concrete properties, such as compressive strength, durability, absorption rate and color stability. The effects of these pigments were studied on Portland cement, the strengths studied by compressive strength test with an average strength of 5.8% for 3days, and the durability studied through water absorption with an average of 6.96%, as well as concrete setting time, and 100% colour retention which is imbedded in the concrete material. It is found from this research that colored pigments does not affect concrete works when applied but enhance compressive strength, inbuilt colour that is not just on the peripheral but imbedded inside the concrete.

**Keywords:** Cement, Pigments, Iron oxide (FeO<sub>3</sub>), Colour retention

## 1.0 INTRODUCTION

Cement is the most widely used and adaptable material in the construction industry for its properties and cost (6). Despite its numerous qualities, the production of cement contributes largely to the release of carbon dioxide (CO<sub>2</sub>) in the atmosphere and, its structures have a dull grey appearance (2). Concrete appearance is affected by many factors, including the ingredients in the mix, mix design, handling and placing procedures, forming and curing methods, surface finishes and textures, environmental conditions, and craftsmanship (8). Concrete used to be grey, it used to be ALL GRAY (4). But, of recent, Engineers, Architects and designers use coloured cement as a tool to incorporate an element of innovation, differentiation and exclusivity to their projects (9). Thanks to colour the possibilities in architecture design have been expanded (3). Furthermore, cementitious products manufacturers are aware of the importance of adding colour to cement, as it makes it possible to give an added value to their products and have a degree of differentiation from their competition (4, 5). This increase in the use of coloured construction materials has been possible thanks to new developments in the incorporation and handling of pigments in recent years (1).

A Pigment is a matter that alters or enhances the colour of any object as an outcome of absorption. Pigmentation in bricks is very vital in the sense that it changes dull objects into eye catching marketable product (7). Iron Oxides pigment are matters that are non-toxic and can resist harsh weather (10), there are two types of iron oxides pigment which have been used for concrete colouration, they are Natural and Synthetic Iron Oxide.

Key components that every manufacturer should have in mind when using iron oxide pigments to colour concrete:

- i. The quality of the Pigment
- ii. Water to Cement Ratio
- iii. Cement Content
- iv. Aggregate colour.

This research work is carried out to produce pigmented colour cement using Iron Oxide (FeO<sub>3</sub>) as the pigment, for direct production of coloured cement and reduce cost of purchasing different materials for the same purpose.

## 2.0 Materials and Methods

**2.1 Materials:** Chemicals used for this research were of analytical grade. The solvent used for this

