

# TITLE OF ARTICLE **TIMES NEW ROMAN 16PT, BOLD, UPPERCASE (SPACING: BEFORE=0PT, AFTER=6PT)**

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**Abstract** — Abstract should include an introduction, background, methodology, value of findings, methodology, quantitative results, and conclusion. **Times New Roman 11pt**

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**Keywords:** (a maximum 6 Keywords) **Times New Roman 10pt**

## 1.0 INTRODUCTION **TIMES NEW ROMAN 12PT, BOLD, UPPERCASE (spacing: before=12pt, after=12pt)**

Natural waste materials such as sludge, rice husk ash (RHA) and groundnut husk ash (GHA), coconut shell, and oil palm shell are mainly used as cement or fine and coarse aggregates replacer. These alternative materials are used to reduce waste and to provide alternative and greener materials in making concrete. Cement replacements are carried out using sludge, rice husk ash (RHA), and groundnut husk ash (GHA) [1,2,3]. As alternatives, natural aggregate replacements were either by using waste or agricultural by-products or solids such as coconut and palm oil shells, sawdust, recycled aggregates, mining tiling waste, and tyre [4]. **Times New Roman 11pt**

## 2.0 MATERIALS AND METHODS

**Table 1** Composition of Plain and Rubberised Fibre Mortar Mixture **Times New Roman 10pt**

| Mix Ref./<br>Percentage | Cement<br>Content<br>(kg/m <sup>3</sup> ) | Fine<br>Aggregate<br>(kg/m <sup>3</sup> ) | Crumb<br>Rubber<br>(kg/m <sup>3</sup> ) | Water<br>Content<br>(kg/m <sup>3</sup> ) | Fibre<br>(kg/m <sup>3</sup> ) |
|-------------------------|-------------------------------------------|-------------------------------------------|-----------------------------------------|------------------------------------------|-------------------------------|
| F0 CR0                  | 740.0                                     | 2035.0                                    | 0.0                                     | 399.6                                    | -                             |
| F0 CR10                 | 740.0                                     | 1831.5                                    | 80.0                                    | 395.5                                    | -                             |
| F0 CR20                 | 740.0                                     | 1628.0                                    | 159.8                                   | 391.5                                    | -                             |
| F0 CR30                 | 740.0                                     | 1424.5                                    | 239.8                                   | 387.4                                    | -                             |

**Note:** The F0 CR0 notations under the 'Mix Ref./Percentage' heading in col. 1 of Table 1 is for ease of identification where 'F' is OPFF, the first '0' is content % of fibre, 'CR' is crumb rubber, and the second '0' is the content % of the crumb rubber. The same notations are applied in describing the samples for every batch. **Times New Roman 9pt**

Besides, the density is measured in accordance with BS 1881- 114 by weighing specimens' masses (kg), which defines it as the mass of a unit volume of hardened concrete expressed in kilograms per cubic metre. Hence, the densities of the mortar cubes were calculated by dividing the mass (kg) by the dimensions of the cubes (m<sup>3</sup>) using Equation 1:

$$\text{Density, } \rho = \frac{M}{V} \quad (1)$$

### 3.0 RESULTS AND DISCUSSION

3.1. Identification of CH and C-S-H as Pozzolan Reaction Indication **Times New Roman 11pt, Capitalize Each Word (subsection) (spacing: before=12pt, after=12pt)**

3.1.1. *Rubber content effects* **Times New Roman 11pt, italic, Sentence case (sub-subsection) (spacing: before=12pt, after=12pt)**

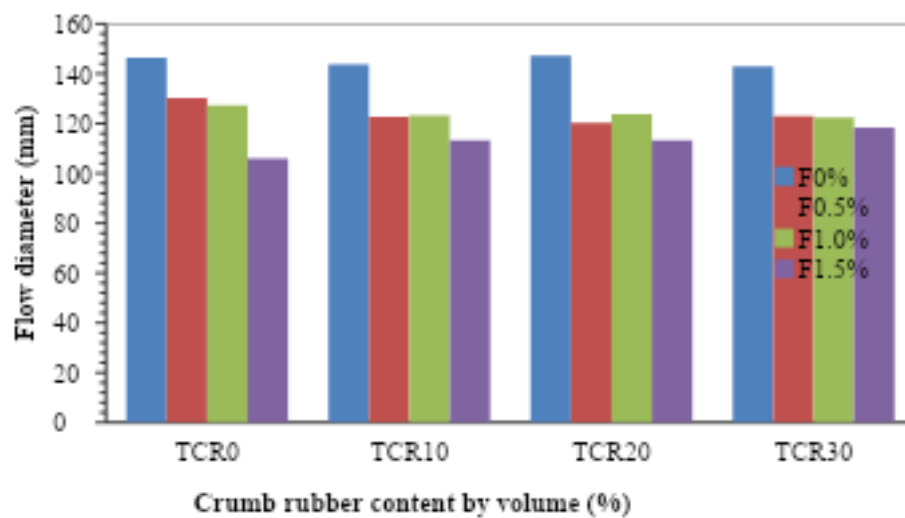


**Figure 1** Workability of RFM as a function of rubber and oil palm fibre contents **Times New Roman 10pt**

### 4.0 CONCLUSION

This paper studied the effects of rubber crumb incorporation on the strength characteristics of cement mortar. It is concluded that while an increased volume of rubber crumb reduces the overall compressive strength, it significantly enhances the material's ductility and energy absorption capacities.

#### Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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