Retraction

Retraction: A Study of Partial Replacement for Cement by Bagasse ASH and Coarse Aggregate (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012008)

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[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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A Study of Partial Replacement for Cement by Bagasse ASH and Coarse Aggregate

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Abstract. The Initiatives are emerging universally to regulate, standardize and improve the quality of by products, remnant and scrap in direction to prevent our atmosphere from pollution. The quality standard clarification for reprocessing the agriculture residue formed after processing the commercial need, the residuals are burned in measured atmosphere. The ashes are further used for additional means. While bagasse are burned in co-generation setup below the measured terms, the sensitive amorphous silica are made because of burning progression.

1. Introduction
The remnant ashes identified as SGBA. The unstructured silica creates SGBA a suitable cement substantial in the concrete matrix. Residues are made in uncontrolled, rapid burning circumstances with high temperature gradually increasing beyond 1000°C ensuing in the crystallization of substantial. In this study the SGBA is intended to custom such as the fractional auxiliary for cement, fine aggregate and admixture to consume the leftovers, also to safeguard the environment commencing from the vulnerabilities [1]. Recycled Coarse aggregate is largely formed from destroyed buildings and concrete, screening and subtraction of impurities such as plastics, steels and reinforcement etc.

1.1. Essential need of SCBA
1. A one ton of CO₂ is generated from one ton of cement production.
2. Manufacturing of cement is responsible for the generation of around 5% of CO₂ in worldwide.
3. This brings constructive effect to the environment [2].
4. Partial replacement for cement in concrete matrix decreases the problem connected with their disposal.
5. Using SCBA will help in subsiding the emission of greenhouse gases.

1.2. Process and Extraction of SCBA
To acquire Sugarcane Bagasse ash (SCBA), burning is operated in two stages- open burning followed by controlled burning at 600°C for few hours [3]. The SCBA collected together for our project is from Sugarcane plant where the burning of SCBA is around 900- 1100°C.

2. Material Properties

2.1 Cement
In concrete cement is the most important binding agent. The main conditions to the choosing of cement is, its capability to create better matrix in concrete [4]. Collecting appropriate grade and noble value of cement is significant to improve the performance of concrete. The key factors play a vibrant part in the collection of different cements. The compressive strength at several periods, fine quality, heat of hydration and alkali content [5]. Cement gel that formed due to heat of hydration decides the strength of concrete matrix (C$_3$S), (C$_2$S) content with admixtures.

2.2 Aggregate
Aggregates inhabit 60% to 80% of concrete making the selection highly vital. Aggregates must contain particles with acceptable strength and resistance to exposure condition and should not comprise any material that will root weakening of concrete [6].

2.3 Sugarcane Bagasse Ash
In India sugarcane cultivated and production of sugarcane from agricultural land is over 320 million tons per year that generates around 11 million tons of sugarcane bagasse ash as idle. The ash which is attained from boiler is a main surplus product. It contains high volume of SiO$_2$. It is categorized as a worthy pozzolanic substantial [7]. Sugarcane Bagasse ash can be used as an additional cementitious material due to its pozzolanic property. Sugarcane bagasse ash is collected from Sakthi Sugars Pvt Ltd., Erode [8-10]. Table 1 shows the Chemical Properties of Sugarcane Bagasse Ash and Figure 1 shows the Sugarcane Bagasse Ash.

![Figure 1. Sugarcane Bagasse Ash](image)

Table 1. Chemical Properties of Sugarcane Bagasse Ash

| Chemical Properties (Oxides) | SCBA % |
|-----------------------------|--------|
| Silica (SiO$_2$)             | 67     |
| Ferric Oxide (Fe$_2$O$_3$)   | 3.52   |
| Magnesium Oxide (MgO)        | 1.05   |
| Sulphur Tri Oxide (SO$_3$)   | 0.37   |
| Loss of Ignition             | 3.9    |
| Alumina (Al$_2$O$_3$)        | 3.04   |
| Calcium Oxide (CaO)          | 5.2    |

2.4 Recycled Coarse Aggregate
Recycled materials are largely created by two phases of demolished concrete, screening and subtraction of impurities such as plastics, steels and reinforcement [11-15]. Reprocessed concrete aggregates are not attained from natural source, but are resulting from construction and destroyed wastes. Table 2 shows Mix Design and Figure 2 shows the Recycled aggregate.
3. Mix Design

Table 2. Mix Design

| Water (Liters/m³) | Cement (Kg/m³) | Fine Aggregate (Kg/m³) | Coarse Aggregate (Kg/m³) |
|------------------|----------------|------------------------|-------------------------|
| 197              | 394            | 649                    | 1109                    |
| 0.50             | 1              | 1.60                   | 2.80                    |

4. Experimental Investigation

4.1 General
In this project the materials such as fine aggregate, coarse aggregate, sugarcane bagasse ash, building debris, and cement are investigated and their results have been discussed in this chapter.

4.2 Procurement of Materials
- Sugarcane bagasse ash is purchased from Sakthi Sugars Ltd, Erode.
- The building demolition debris is collected from Somanur.
- Fine aggregate and coarse aggregates are purchased from Somanur.

4.3 Test on Fine Aggregate and SCBA
- Sieve analysis test
- Water absorption test
- Specific gravity test

5. Result and Discussion

5.1 Compressive Strength Test
The compression tests are used to define hardness of cubical and cylindrical samples of concrete. The strength of a concrete sample governed upon cement, aggregate, water cement ratio, curing temperature and size of the specimen. The sample should be given adequate time for hardening and this must be cured for 28 days. Table 3 shows the Compressive Strength Test on Concrete and Figure 3 shows the Compression test on concrete.
Figure 3. Compression test on concrete

Table 3. Compressive Strength Test on Concrete

| Percentage of mix       | 7th day test (N/mm²) | 14th day test (N/mm²) | 28th day test (N/mm²) |
|------------------------|----------------------|-----------------------|-----------------------|
| Conventional           | 19.14                | 26.51                 | 29.46                 |
| 10% SCBA 15% RA        | 22.30                | 30.88                 | 34.32                 |
| 10% SCBA 20% RA        | 24.60                | 34.07                 | 37.86                 |
| 10% SCBA 25% RA        | 26.96                | 37.33                 | 41.48                 |
| 10% SCBA 30% RA        | 23.79                | 32.94                 | 36.61                 |

Figure 4. Comparison of compressive strength of concrete

5.2 Flexural Strength of Concrete
The load applying faces and two-point rollers will be cleaned, and fine aggregate or additional material disinterested from the faces of sample where this making connection on rollers. The sample will be positioned in the machine in such a way that the load will be functional on the top surface, along the two supports set apart 15 cm. The line of sample will be cautiously associated in the line of force applying machine. No separate layers are created to apply load in the surface. The load will be functional without shock and growing linearly. The load will be increased until the model fails, and the extreme
load applied to the sample throughout the test to be recorded. Figure 4 and Figure 6 shows Comparison of compressive and flexural strength Test of Concrete. The exterior of the cracked appearances of concrete and some unfamiliar properties in the kind of failure will be noted. The flexural strength of the sample shall be communicated as modulus of rupture \( F_b \), which, if \( \alpha \) matches the space between among the axis of crack and nearest support, measured on the middle line of the tensile side of the sample. Table 4 shows and figure 5 shows the flexural strength.

![Figure 5. Flexural test on concrete](image)

**Table 4. Flexural Strength**

| Concrete          | 7th day \(^2\) (N/mm\(^2\)) | 14th day \(^2\) (N/mm\(^2\)) | 28th day \(^2\) (N/mm\(^2\)) |
|-------------------|-------------------------------|-------------------------------|-------------------------------|
| Conventional      | 4.23                          | 5.85                          | 6.50                          |
| 10% SCBA 15% RA   | 4.39                          | 6.07                          | 6.75                          |
| 10% SCBA 20% RA   | 4.71                          | 6.52                          | 7.25                          |
| 10% SCBA 25% RA   | 4.98                          | 6.75                          | 7.50                          |
| 10% SCBA 30% RA   | 4.55                          | 6.30                          | 7.00                          |

![Figure 6. Comparison of flexural strength Test of Concrete](image)

**Figure 6.** Comparison of flexural strength Test of Concrete

6. **Conclusion**

From the experiments and investigation in this research, we observed the below facts
1. Due to lack of natural resources at sensible cost as cement and coarse aggregate in concrete for various motives, search for substitute material like SCBA and recycled aggregates which succeeds itself as an appropriate stand-in for cement and coarse aggregate at low cost.

2. The average Compressive strength of concrete at 28th day for mix containing 10% SCBA and 14%, 11%, 25%, 30% of RA are increased by 16.5%, 28.5%, 40.8% and 24.3% respectively.

3. The average Flexural strength at 28th day for the mix containing 10% SCBA and 15%, 20%, 25%, 30% of RA are increased by 3.8%, 11.5%, 15.4% and 7.7% respectively.

4. SCBA and RA increases the complete power of the concrete. Optimum proportion of replacement is obtained as 10% of Cement by SCBA and 25% of Coarse Aggregate by RA with W/C ratio of 0.49.

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