X ray Diffraction (XRD) Analysis of Coir Pith Concrete

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Abstract: ***The usage of waste product in concrete decreases the major issue of dumping problems in the society and as well as its economical also. Coir pith is one among that product from coconut industry. In this examination accentuation was made on the practicality of utilization of coir pith as a fractional substitution of regular sand in concrete. The XRD analysis has been done for treated coir pith material and the concrete in which the same has been added. Thus the result of the XRD test shows the presence of each component in that particular material with accurate percentage and so it reveals that whether it matches all the necessary components which are present in river sand. This research paved the way to overcome the disposal problems caused by the waste materials as well as in economic point of view. Adding coir pith in the concrete needs an outer surface treatment in advance, which actually removes the dirt and dust. The effectiveness of the outer surface treatment carried out on the coir pith is assessed by XRD examination. Alkaline treatment causes a slight change in the structure of the cellulose. By dying coir pith treated with NaOH, the range of treated coir pith shows an adjustment in the expulsion of hemicellulose and lignin from the outside surface of coir pith. These outcomes demonstrate that the treatments were done effectively to change the qualities of the outside surface of the coir pith by removing the dirt and dust. Thus after treating this coir pith with NaOH, it is now ready to partially replace with sand in concrete.***

Keywords: *Natural sand, coir pith, concrete, XRD*

I. INTRODUCTION

High intake of raw materials, excessive quantity production of commercial wastes and environmental pollutants are a number of the factors that are capable for obtaining new approach for a sustainable improvement. Increase in efficiency of resources is oriented towards sustainability. Lowering energy and resource consumption increases resource efficiency. Thus, solution is utilization of agricultural waste such as coir pith in producing concrete. Introducing new materials in concrete, lowers construction cost, imparts high durability thereby producing eco friendly concrete which reduces the impact on economy and environmental pollution caused by the construction industry.

II. MATERIALS AND METHODS

A. X Ray Diffraction (XRD) method

Divergence could be a physical paradox that's composed in EM radiation warding off limitations in case the scale of the barriers matches to the frequency. This paradox has carried out for the investigation of specimens since the particle plans are positioned at similar stretch to X ray lengths.

Revised Manuscript Received on January 15, 2020.

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X rays are EM waves much like light, but whose frequency is more concise (λ=0, 2 to 200 Å). XRD is generated as a reflection at legitimately characterized viewpoints.
Each crystalline segment has its self-diffraction picture. For the XRD assessment we utilize diffraction gadgets, particularly admit to the Bragg–Brentano framework (figure1).The basic pattern revolves at a divergent attitude as "θ", even as the sensor revolves at the angle of "2θ".

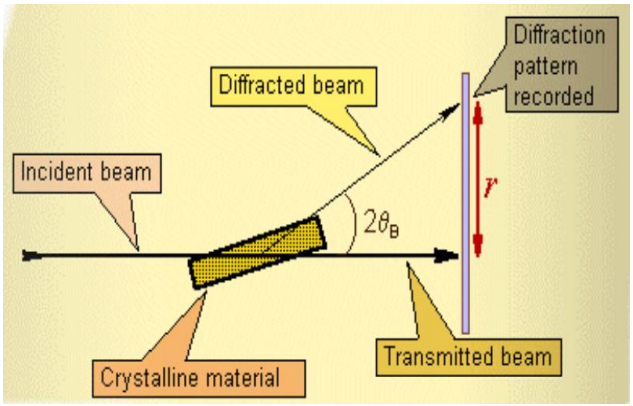

Figure 1-The outline of X Ray Diffractometer

Figure 2-X Ray powder Diffractometer

A series of divergent peak values are inverted by the equipment called diffractogram. Then the range of depth of the divergent X ray is displayed and measured in the form of pulses or second. Along with this, the Bragg angle is also determined in terms of degrees and it is denoted as "θ". Each structure of the specimen has its own divergent image depends on the individual type. The diffraction system permits overall execution in subsequent research: The details of crystalline structures were found in terms of qualitative and quantitative investigation.

The segment alterations were examined for the identification of many factors such as the crystallographic type, the scale of the inner components of the particular specimen and many others.

The X ray divergent technique is used to describe and complete the crystalline phases, if the respective phase imitate extra of 3 to 4% mass. Few software's are used to explain the Bragg's relationship such as match software, in the Powder Diffraction File (PDF) database.

B. Strengths of XRD method

- Strong and quick (less than 20 minutes) method of determination for uninvestigated material
- Commonly, it gives an accurate (unblurred) percentage of mineral composition
- Only minimum specimen arrangements are needed
- Generally XRD units were accessible
- Data illumination is almost a sort of clear-cut

III. ANALYSIS & RESULTS

A. XRD Analysis & results

The XRD analysis is studied at room temperature using powder X – Ray diffraction with wavelength of 1.541874Å. Specimens are inspected in an uninterrupted method of 2theta between 10^{o}-70^{o} at a rate of one second.

The X-Ray powder diffraction gives the graph between the intensity of the X – Ray light which is scattered on the sample and angle difference of the deflected X – Rays. The X – Ray powder diffraction was done on two samples such as S1 and S2. Where, S1is indicated for treated coir pith material alone and SiO_2 is indicated for treated coir pith concrete for 28 days of curing. The graphs were generated using the Match and Origin pro8 software.

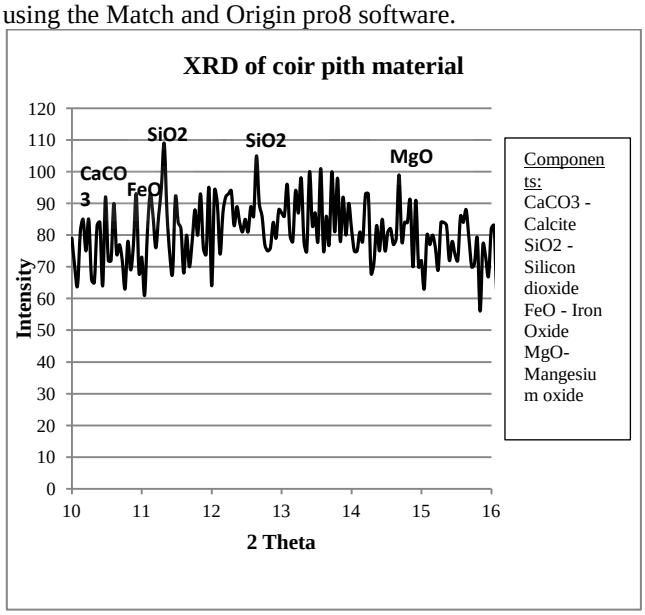

Fig 3: X Ray Diffraction (XRD) of coir pith material

XRD analysis for treated coir pith material indicates the predominance of quartz or silica (SiO_2), calcite (CaCO3), Iron Oxide (FeO) and magnesium oxide (MgO) are observed in Fig: 3. In the plot large amount of quartz or silica (SiO_2) that this material can be partially replaced for sand in concrete.

Table 1: XRD of treated coir pith in concrete

Sl.No	2Theta (2 θ)	Intensity (Peak height)
Silicon dioxide (SiO_2)		
1	26.68	1000
2	20.85	449.3
3	54.94	145.1
Calcite (CaO_3)		
1	29.37	59.5

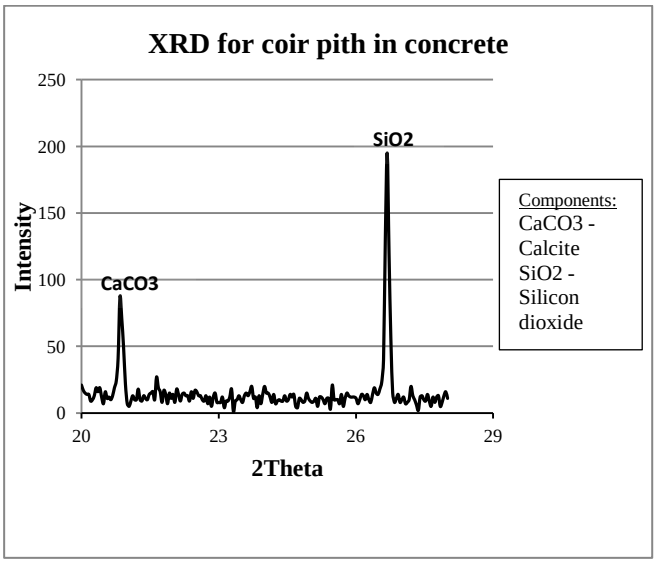

Fig 3.1: X Ray Diffraction (XRD) of treated coir pith in concrete

XRD analysis for partially replaced treated coir pith in concrete specimen indicates the predominance of quartz or silica (SiO_2) and calcite (CaCO3) are observed in table: 1 and Fig: 3.1. In the plot large amount of quartz or silica (SiO_2) indicates that the strength in concrete will not be compromised by replacing this material for sand.

IV. CONCLUSION

Nowadays the cost of river sand is increasing day by day due to less availability. Since to overcome this problem in construction field, we have to choose an alternative material for river sand.

XRD result of treated coir pith material shows the presence of quartz or silica (SiO_2) in peak and also other necessary components of sand. XRD result for partially replaced treated coir pith in concrete specimen shows the presence of quartz or silica (SiO_2) in peak. Thus it indicates that this material can be used as a partial replacement material for sand in concrete.

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