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A REVIEW ON THE POZZOLANIC PERFORMANCE OF SUGARCANE BAGASSE ASH

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Abstract**:** Sugarcane bagasse ash is a resultant waste product from cogeneration combustion boilers in sugar industries The disposal of this causes environmental problems surrounding the factories, therefore its consumption for fruitful purpose is necessary. It is rich in silica, place the role of effective pozzolana and also considered as an effective mineral admixture. The utilization of bagasse ash has been considered uneasy because of the lack of suitable processing methodology. Based on processing method of sugarcane bagasse ash the pozzolanic activity of the material varies. Processing methods significantly influence the pozzolanic activity of any supplementary cementitious material. This study involves pozzolanic performance evaluation of sugarcane bagasse ash for using as pozzolanic material in concrete. An evaluation of pozzolanic activity of sugarcane bagasse ash based on different processing methods like burning, grinding, complete removal of coarse fibrous particles by sieving and combinations of these methods are presented in this seminar. All the process above shows different characteristics of sugarcane bagasse ash.

Index Terms – *Pozzolanic material, Sugarcane bagasse ash, Processing*

I.INTRODUCTION

1.1 General Background

Sugarcane bagasse ash is a composition of amorphous silica and can be used as one of the effective supplementary cementitious material in concrete preparation.Very limited investigation have been carried out on bagasse ash as supplementary cementitious material. The utilization of bagasse ash is as pozzolanic material in concrete. Therefore knowledge on the processing of sugarcane bagasse ash is fundamental.

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Fig.1 Sugar cane bagasse and sugar cane bagasse ash
(Source: Noridah Mohamad et.al, 2019)

II.EXPERIMENTAL METHODS AND RESULTS

Burning-Sugarcane Bagasse ash is taken from the cogeneration boiler. The bagasse ash was further burnt to 600 °C, 700 °C, 800 °C, and 900 °C for 90 min. After burning, the burnt bagasse ash was suddenly cooled to room temperature to develop the reaction of the sample. Burnt sample was stored in air-tight containers till the pozzolanic test is done.

Effect of burning on pozzolanic activity- Pozzolanic activity index of burnt samples was analysed higher than the raw bagasse sample from 71 to 84% at 7days.Sample burnt at 700 °C had maximum pozzolanic activity index value of 84% and 86% at 7 days and 28 days respectively. The compressive strength increased from 7 to 28 days because of the additional pozzolanic activity of burnt samples. After 700 °C the pozzolanic activity was reduced with increase in temperature mainly due to crystallization of amorphous silica content to crystobalite. When the samples are burnt above 900 °C white particles are noticed due to crystallization as well as thermal decomposition of sugarcane bagasse ash.

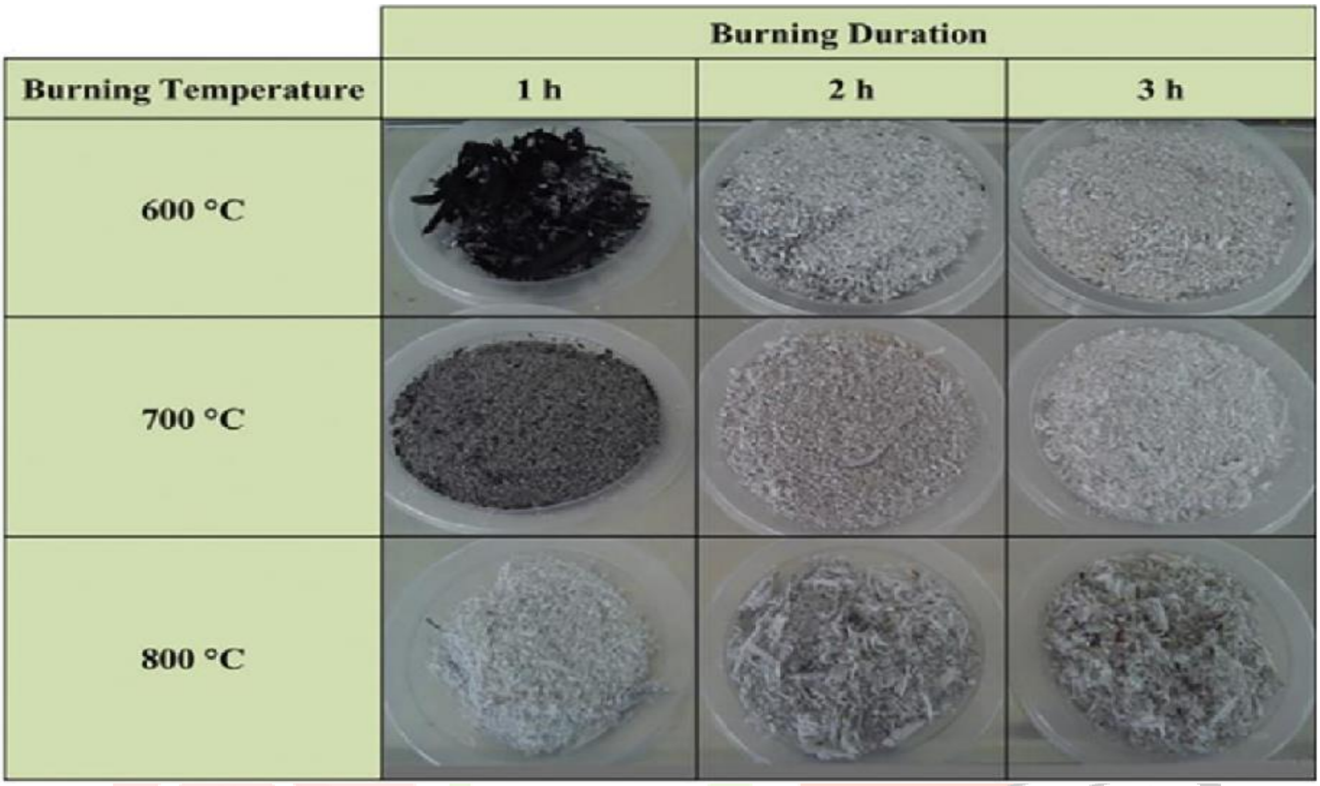

Fig 2. Appearance of SCBA with different calcination temperatures and durations
(Source: Qing Xu et.al, 2018)

Removal of coarse carbon particles by sieving –The sugarcane bagasse ash contains completely burnt fine particles and fibrous coarse unburnt particles. Floating process is used to separate fibrous unburnt carbon material. Sieving process is done for the complete removal of coarse particles from raw bagasse ash. The material passing through 300 µm sieve include fine burnt particles that are highly rich in silica content**.**

Grinding process - Dried raw bagasse ash was ground by mechanical grinding method to various size and resultant material was separated to respective sizes by using sieve. Raw bagasse ash was ground to 210, 180, 150,125, 105, 75, 53, 45µm fineness, and finally stored in air tight containers for further test of pozzolanic activity. Combined effect of burning and grinding was also noticed to get the maximum possible pozzolanic activity of sugarcane bagasse ash. The burnt material which has higher pozzolanic activity from the burning study was ground to cement fineness (300 m^2/kg). The sieved material was also ground and pozzolanic activity of both materials was tested. Burnt and sieved samples were ground to cement fineness (300 m^2/kg) using ball mill. However, fineness of ground materials was found by Blaine air permeability test. After grinding, the material was stored in air tight containers for further testing.

Effect of grinding on raw bagasse ash sample- To achieve the minimum requirement (75% pozzolanic activity index), the raw bagasse ash sample needs to be ground to a material finer than 53 µm. Effect of grinding on the pozzolanic activity was not completely accepted as it include more fibrous unburnt carbon particles in the ground samples .

Effect of grinding on sieved and burnt samples- Pozzolanic activity index value of burnt and ground sample was increased from 86% to 90% by the process of grinding. Grinding of sieved sample significantly increased its reaction because of removal of coarse fibrous carbon particles before grinding.

COD	mg/l	472	228	250
Conductivity	ms	1.02	1.02	1.5-2.0
Turbidity	NTU	8	13	5
Hardness	mg/l	72	44	-
Ammonia Nitrogen	mg/l	80	62.4	-

Fig 3: Production of SCBA based Portland pozzolana cement.

(Source: Bahurudeen A et.al, 2015)

III MAJOR POINTS ANALYSED

Burning at 700°C improved pozzolanic activity of raw bagasse ash from 72% to 86% at 28 days. Additional energy, skilled supervision and strict control is required for the burning process. Again grinding of burnt material (700 °C) to cement fineness by using ball mill increased pozzolanic activity to an additional extent (90%). The simple sieving process by passing through 300 µm sieve increased pozzolanic activity highly above the minimum requirement (75%). Inorder to achieve minimum processing steps with maximum pozzolanic activity, sieving and further grinding to cement fineness is highly ensured.

IV CONCLUSION

Raw bagasse ash sample has lesser pozzolanic activity compared to that of burnt sample. Burnt bagasse ash at 700 °C showed maximum pozzolanic activity than 600°C and 800°C.Bagasse ash ground to less than 53 µm can be considered as a mineral admixture. Sieving through 300 µm sieve and grinding to cement fineness of about 300 m2 /kg was considered as a best method to achieve pozzolanic activity due to the low value of loss on ignition and minimum processing energy of bagasse ash compared to other processing methods.

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