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Utilization of Rice Husk Ash in the Production of Porcelain

Sunil Gulia[1], Kapil[2], Devender[3], Amit[4] ,Sumit[5]

UG Student, Department of Civil Engineering, Dronacharya College of Engineering Gurgaon Haryana India

Abstract**: This research project focuses on utilization of rice husk ash for the production of porcelain. Due to the fast polluting environment there is an increasing demand for durable construction materials. Rice (Oryzasativa) is a great example of alternate material. Rice husk is a byproduct of rice milling industry. It constitutes about 50% cellulose, 25?30% lignin, and 15?20% of silica. This rice husk can be used as great source of fuel. When it is burnt under specific set of temperature and conditions lignin and cellulose are removed and only rice husk ash which is also known as RHA is obtained. This obtained RHA contains approximate 95% of silica. This silica can be used for the production of porcelain. Production of porcelain through RHA is not only eco friendly but it also increases the strength and durability as compared to ordinary porcelain. These RHA produced porcelain proves to be more effective supplementary material as it is economical, less costlier, strong and durable. Also the bulk density of vis reduced by the use of RHA.

Keywords- Durability, porcelain, rice husk, RHA(rice husk ash), silica

I. INTRODUCTION

Rice husk is an agricultural residue or the by product of rice milling industry. The chemical composition of different rice samples is found to be varying due to difference in climatic conditions, type of paddy and other geographical conditions. About 650 million of rice is produced worldwide of which 20% is obtained as rice husk. The present conditions of world demands greatly for the use of durable materials which is also strong. Rice husk is a great example of such material. Burning the rice under controlled conditions at temperature below 800 ?C produced silica in amorphous form. This silica can be utilized for constructional works. In the production of porcelain around 20% silica is required. This demand can be full filled from rice husk. Chemical compostion of RHA is shown below.



II. RELATED WORK

Recent studies in literature have been covered in the past on rice husk. Also various research papers have been published on the use of rice husk. One of the example of such type of work is the use of rice husk in production of concrete blocks. Current situation demands of more durable and environment friendly materials due to polluting environment. So rice husk use in concrete block was a great example set by various research projects in the past. RHA when blended with cement proves to be a very effective green material. Various properties are being altered by use of RHA in concrete such as heat of hydration is reduced, reduced permeability at higher dosage, increased sulphate resistance. RHA can be used as an admixture to prevent the attack of chemicals such as mild acids, alkalies etc. In other nations such as Thailand RHA is also utilized as a fuel for power generation in nuclear plants.

In this project our aim is to efficiently use the previous studies carried on RHA for further research in glass production.

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III. METHODOLOGY

In the process of preparation of rice husk ash first of all rice husk is obtained as a by product of rice milling industry during paddy extraction. Then rice husk is burnt in boilers under specific temperature and condition. Generally temperature is kept between 700^{0}C-800^{O} C with proper supply of oxygen. After burning of rice husk at the above mentioned temperature cellulose, lignin are removed and rice husk ash is obtained in which approximately 95% silica is present.



Rice husk



Burning rice husk



Carbonized rice husk



Rice husk ash (RHA)

The above figure shows how rice husk is burnt to obtain rice husk ash. If it heated in less supply of oxygen then carbonized rice husk is formed which is shown in the above figure.

The silica which is obtained from rice husk ash is utilized in the production of porcelain. In the manufacturing of porcelain generally 20% silica is used. This requirement of silica is full- filled by the

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silica extracted from RHA. In our project we will use the silica obtained from rice husk ash as our primary material. Also make sure that there is no impurity present in the obtained silica. The further process is carried out in the same manner as for an ordinary used porcelain.

IV. EXPERIMENTAL STUDY

Extraction processes for silica from RHA:-

The first step includes extraction of silica from ash as sodium silicate

using caustic soda. This reaction is carried out at a temperature

in the range 180^0 C and pressure ranging from 6-8 atmosphere.

The reaction is:

SiO_2 + 2NaOH ----------> Na_2SiO_3 + H_2O

(Ash) +(caustic soda) 6-8 atm. (sodium silicate)+ (water)

The second step of the process includes silica being precipitated from sodium-silicate by the use of sulphuric acid, under controlled conditions of addition rate of sulphuric acid and temperature of reacting mass. The temperature is kept in the range of 90-100^{o}C and pressure is normal atmospheric.

The reaction is:

Na_2SiO_3 + H_2SO_4 ----------> SiO_2 + Na_2SO_4 + H_2O

(Sodium silicate)+ (sulphuric acid) ⇨ (silica) + (sodium sulphate) + (water)

V. CONCLUSION

In this fast polluting environment the need of hour are more durable construction materials. RHA produced porcelain are more durable and posses better compressive strength as compared to ordinary used porcelain. They are also eco friendly .Hence it can be concluded that RHA produced porcelain far much better in every aspect.

With the addition of RHA weight density of porcelain reduces .Thus, RHA porcelain can be effectively used. The cost of RHA porcelain works out to be less than the ordinary porcelain. Thus, the use of RHA in porcelain leads to saving in material cost. So, the addition of RHA in porcelain helps in making an economical concrete. The Compressive Strength will increase with the addition of RHA. RHA has the potential to act as an admixture, which increases the strength, workability & pozzolanic properties of porcelain

REFERNCES

[1] http://www.niir.org/projects/projects/rice-husk-rice-hull-rice-husk-ash-agricultural-waste-based-projects/z,,70,0,64/index.html

[2] http://www.issres.net/journal/index.php/crl/article/viewFile/83/3

[3] Appea, A. K., Al-Qadi, I. L., Bhutta, S. A., and Coree, B. J., ?Quantitative Assessment of Transmission Layer in Flexible Pavements,? 77th Transportation Research Board, Paper No. 980994, Washington, DC, 1998.

[4] IRC, ?Guidelines for the Design of flexible pavements,? IRC: 37-1970, Indian Roads Congress.

[5] Battiato, G., and Verga, C., ?The AGIP Visco elastic Method For Asphalt Pavement Design,? Proceedings Of The Fifth International Conference On The Structural Design Of Asphalt Pavements, Ba Arnhem; Netherlands, August 23-26 1982, pp. 59-66.

[6] Al-Qadi, I. L., Brandon, T. L., Smith, T., and Lacina, B. A., ?How Do Geosynthetics Improve Pavement?s Performance,? Proceedings of Material Engineering Conference, San Diego, CA. 1996, pp. 606-616.

[7] Barksdale, R. D., Brown, S. F., and Francis, C., ?Potential Benefits of Geosynthetics in Flexible Pavement Systems,? National Cooperative Highway

IJRASET: ISSN: 2321-9653 Volume II Issue IX, September 2014

Research Program, Report No. 315, Transportation Research Board, Washington, D. C. 1989.

[8] ISI, ?Indian Standards Specifications for Roads Tar?, IS: 215, Indian standard Institution.

[9] IRC, ?Tentative Specifications for Bituminous Surface dressing Using Pre-coated Aggregates,? IRC: 48-1972, Indian Roads Congress.

[10] Al-Hadidy A.I., Yi-qiu Tan (2009), ?Effect of polyethylene on life of flexible pavements?, Construction and Building Materials, Vol. 23.

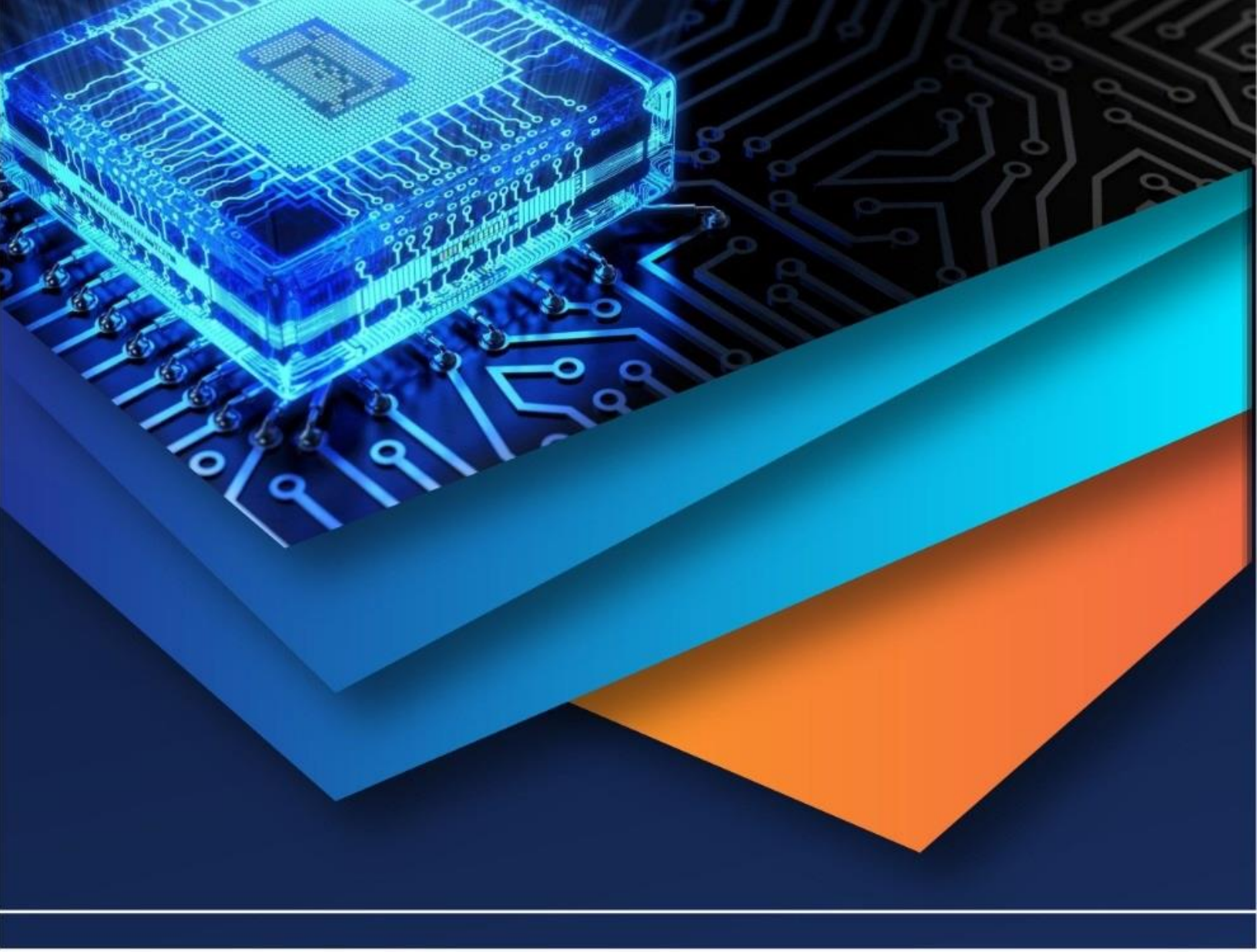
[11] Annette R. Hill, Andrew R. Dawson, Michael Mundy.,(2001), ?Utilisation of aggregate materials in road construction and bulk fill?, Resources, Conservation and Recycling, Vol. 32, School of Civil Engineering, University of Nottingham, Australia, pp 305?320.

[12] Aravind K. , Das Animesh, (2007), ?Pavement design with central plant hot-mix recycled asphalt mixes?, Construction and Building Materials, Vol. 21, Dept. of Civil Engg., Indian Institute of Technology Kanpur, India, pp 928?936.

[13] Bandopandhyay T. K., (Jan. - Mar. 2010), ?Construction of Asphalt Road with Plastic Waste?, Indian Center for Plastic in Environment (ICPE), ENVIS Eco- Echoes, Vol.11, Issue 1

[14] Dhodapkar A N., (Dec. 2008), ?Use of wasteplastic in road construction?, Indian Highways, Technical paper, journal, P No.31-32.

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