Use Glass Powder as Pozzolanic Material in Concrete

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***Abstract*: In our every-day life Glass is used in different forms and shapes. It is a non-biodegradable material. After the use of the glass, it is either send to dumping sites or may be pilled in large content on some site. As due to its non-biodegradable nature, it is not good solution to dump it in dumping sites and it is also not environment friendly. Therefore the best solution is to utilize these glass wastes.**

The present work reveals that waste glasses, if crushed finer than 100µm displays a pozzolanic behavior. In the first hydration stage glass powder reacts with lime forming a further CSH gel thus creating a dense cementitious matrix. The initial consumption of alkalis by glass powder particles reduces alkali-silica reaction thus increasing the durability of the concrete matrix.

***Keywords*: glass powder, concrete, compressive test, capillary absorption test.**

Introduction

The glass waste is not so harmful to the environment as it does not contribute to the pollutants but can be dangerous to humans and animals. If it is not handle carefully it can harm due to its non-biodegradable nature to the environment. Nowadays these types of glass waste powder is widely used in cement and aggregate mix as pozzolana in the construction industry.

The alkali content in the cement gets increased by the introduction of glass waste in it. Glass waste also benefits in bricks and ceramic production and it conserves raw materials, drops energy consumption and volume of waste to the landfill. As valuable recycled materials, glasses and glass powder are generally used in fields associated to civil engineering, eg in cement, as pozzolana (additional cementitious materials), and coarse aggregate.

Literature review

A ton of works has been done to find the advantages of utilizing pozzolanic materials in making and upgrading the properties of cement. M.D.A. Thomas, M.H.Shehata et al. have examined the ternary cementitious mixes of Portland bond, silica smoke, and fly powder offer noteworthy preferences over double mixes and much more noteworthy improvements over plain Portland concrete. Sandor Popovics have considered the Portland bond fly fiery debris - silica seethe frameworks in concrete and finished up a few valuable impacts of expansion of silica smoke to the fly slag bond mortar as far as quality, usefulness and ultra sonic speed test results. Jan Bijen have considered the advantages of slag and fly fiery remains added to concrete made with OPC as far as soluble base silica response, sulfate assault. L. Lam, Y.L. Wong, and C.S. Poon in their concentrated entitled Effect of fly fiery remains and silica rage on compressive and break practices of cement had closed improvement in quality properties of cement by including diverse level of fly powder and silica rage. Tahir Gonen and Salih Yazicioglu studied the impact of parallel and ternary mix of mineral admixtures on the short and long haul exhibitions of concrete and finished up many improved solid properties in crisp and solidified states. Mateusz Radlinski, Jan Olek and Tommy Nantung in their exploratory work entitled Effect of blend structure and Initial relieving conditions on the scaling opposition of ternary cement have discover impact of various extents of elements of ternary mix of fastener blend on scaling obstruction of cement in low temperatures. S.A. Barbhuiya, J.K. Gbagbo, M.I. Russeli, P.A.M. Basheer considered the properties of fly cinder concrete changed with hydrated lime and silica rage reasoned that expansion of lime and silica seethe improve the good 'ol days compressive quality and long haul quality advancement and solidness of cement. Susan Bernal, Ruby De Gutierrez, Silvio Delvasto, Erich Rodriguez completed Research work in Performance of a soluble base initiated slag concrete strengthened with steel strands. Their decision is that The created AASC present higher compressive qualities than the OPC reference cements. Part rigid qualities increment in both OPCC and the AASC cements with the consolidation of fiber4s at 28 restoring days. Hisham Qasrawi, Faisal.

Objectives of research:

- To assess the recyclability of powdered waste glass as a pozzolana (SCM) as fractional substitution of bond in the solid.

- To contemplate the near impacts of expansion of powder glass, fly fiery debris and silica exhaust in concrete as pozzolana to alleviate salt total response.

Conclusions

1. Waste glass, if ground better than 100µm demonstrates a pozzolanic conduct.
2. The littler molecule size of the glass powder has higher action with lime bringing about higher compressive quality in the solid blend.
3. Compared to fly slag concrete, better glass powder concrete had marginally higher early quality just as late quality.
4. The coefficient capillary absorption test additionally shows that joining of better glass powder improves durability.
5. Glass powder of size 150µm - 100µm display inception initiation of alkali aggregate reaction. The presence of ettringite confirms this.
6. The information introduced in this investigation shows that silica is best SCM. It gives most noteworthy compressive quality due to its littler grain measure and round shapes.
7. The outcomes acquired from the present examination demonstrates that there is incredible potential for the usage of best glass powder in concrete as substitution of bond.
8. The fine glass powder can be utilized as a swap for costly materials like silica smoke and fly fiery debris.
9. It can be inferred that 30% of glass powder of size under 100µm could be incorporated as bond substitution in cement with no negative impact.

REFERENCES:

[1] Thanongsak, N., Watcharapong, W., and Chaipanich. A., (2009), "Utilization of fly ash with silica fume and properties of Portland cement-fly ash-silica fume concrete". Fuel, Volume 89, Issue 3, March 2010, Pages 768-774.

[2] Patel, A, Singh, S.P, Murmoo, M. (2009), "Evaluation of strength characteristics of steel slag hydrated matrix" Proceedings of Civil Engineering Conference- Innovation without limits (CEC-09), 18th - 19th September" 2009.

[3] Li Yun-feng, Yao Yan, Wang Ling, "Recycling of industrial waste and performance of steel slag green concrete", J. Cent. South Univ. Technol. (2009) 16: 8−0773, DOI: 10.1007/s11771-009-0128-x.

[4] Velosa, A.L, and Cachim, P.B.," Hydraulic lime based concrete: Strength development using a pozzolanic addition and different curing conditions", Construction and Building Materials ,Vol.23,Issue5, May2009,pp.2107-2111.

[5] Barbhuiya S.A., Gbagbo, J.K., Russeli, M.I., Basheer, P.A.M. "Properties of fly ash concrete modified with hydrated lime and silica fume", [a]Centre for Built Environment Research, School of Planning, Architecture and Civil Engineering, Queen"s University Belfast, Northern Ireland BT7 1NN, United Kingdom Received 28 January 2009; revised 1 June 2009; accepted 3 June 2009. Available online 15 July 2009.

[6] Gonen,T. and Yazicioglu,S. " The influence of mineral admixtures on the short and long term performances of concrete" department of construction education, Firat University, Elazig 23119, Turkey.2009.

[7] Mateusz R.J. O. and Tommy N. " Effect of composition and Initial Curing Conditions of Scaling Resistance of Ternary(OPC/FA/SF) concrete", Journal of Materials in Civil Engineering © ASCE/October 2008, PP 668-677.

[8] Chang-long,W QI, Yan-ming,He Jin-yun, "Experimental Study on Steel Slag and Slag Replacing Sand in Concrete", 2008, International Workshop on Modelling, Simulation and Optimization.

[9] Jigar P. Patel, "Broader use of steel slag aggregates in concrete", M.Tech.thesis, Cleveland State University, December, 2008.

[10] N.P. Rajamane *, J. Annie Peter, P.S. Ambily," Prediction of compressive strength of concrete with fly ash as sand replacement material". Cement and Concrete Composites, Volume 29, Issue 3, March 2007, Pages 218-223. Abdullah A. Almusallam, Hamoud Beshr, Mohammed Maslehuddin, Omar S.B. Al-Amoudi,, "Effect of silica fume on the mechanical properties of low quality coarse aggregate concrete", Cement & Concrete Composites 26 (2004) 891-900.

[11] Turkmen.I," Influence of different curing conditions on the physical and mechanical properties of concrete with admixtures of silica fume and blast furnace slag", Materials Letters 57 (2003), pp.4560-4569.Article/ View Record in Scopus/Cited by in Scopus(9).

[12] Tasdemir,C," Combined effects of mineral admixtures and curing conditions on the sorptivity coefficient of concrete", cement and concrete research 33(2003), pp. 1637-1642.

[13] IS 2720(III/SEC-I): 1980 Methods of Test for Soils, Determination of specific gravity.

[14] IS 2720(IV):1985 Methods of Test for Soils, determination of grain size analysis.

[15] Thomas, M. D. A. and Shehata, M. H. "Use of ternary cementitious systems containing silica fume and fly ash in concrete "; cementand concrete research 29 (1999). Bijen, J. " Benefits of slag and fly ash " construction and building materials , vol.10, no.5,pp. 309-314, 1996.