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A COMPREHENSIVE OVERVIEW ON PERFORMANCE OF ALCCOFINE CONCRETE

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Received on 10-01-2017

Accepted on: 12-02-2017

Abstract

In this paper reports from few researchers have been studied on strength and durability performance of alccofine as a partial replacement of cement in concrete. The efforts made by the researchers for enhancing the performance of concrete over the last few years proved that supplementary cementitious materials with mineral and chemical admixtures can improve the strength and durability of concrete. Alccofine is one among the supplementary cementitious materials. Alccofine is new pozzolanic material which is bringing technical revolution in the construction industry. From the survey it is found the alccofine can achieve high strength when is replaced by cement at 0% - 20% compared to the traditional concrete.

Keywords: Concrete, Strength, Durability, Alccofine.

1. Introduction

Cement based materials are the essential production materials and they will have maximum possibly to continue the same significance within the future. While dealing with problems like production, economic conditions, quality and environmental issues, they need to compete with different construction materials along with plastic, metallic and timber. Long lasting concrete will retain its quality and serviceability while exposed to environment. Cement based materials for concrete should be fine mineral powders such as fly ash, ground granulated blast furnace slag, limestone, silica fume and alccofine. These cement based materials are mixed with cement or at the mixer when the concrete is being produced.

This paper gives information about the behaviour of alccofine in concrete. Alccofine is the micro fine material of particles finer than that of cement, fly ash, silica and many other cement based materials which are producing in India. This material had a unique character to enhance the performance of concrete in all the stages because of its optimized particle size distribution.

2. Literature Review on Strength and Durability Properties

S. Kavitha and T. Felix Kala (2016) have explained about the use of alccofine within the SCC as the strength enhancer. They found the improvement in strength properties with increase in alccofine dosage and the results of their investigation proved that alccofine can be used as a strength enhancer within the SCC.

D. Sharma, S. Sharma and Ajay. G (2016) conducted experimental investigation about the strength improvement of concrete using foundry slag as an alternative for conventional fine aggregate and alccofine as substitute for cement. They concluded that reasonably high strength concrete can be achieved by means of substituting fine aggregate with 10% to 45% of foundry slag and replacement of cement with 15% of alccofine.

M. V. Sekhar Reddy, k. A. Latha and k. Surendra (2016) had done experimental work on partial replacement of cement with fly ash and alccofine for M40 Grade concrete. The fly ash and alccofine are replaced at 5%, 10%, 15%, 20% with cement. The conclusion summarizes that the addition of alccofine indicates an early strength gaining capacity and is ecofriendly to nature. Alccofine showed greater results then compared with fly ash in long term Strength Properties.

K. Gayathri, K. R. chandran and J. Saravanan (2016) performed research on performance of alccofine replacing the cement in concrete at 5%, 10%, 15% and 20%. It is found that 15% replacement of cement by alccofine is yielding good strength when compared to other percentages and also alccofine increases the cementing efficiency at earlier ages of concrete.

M. Y. Patel, Darji and Purohit (2015) conducted experimental investigation on overall performance of compression test on concrete mix at 28 and 56 days. They concluded that concrete with combination of alccofine and glass powder gives higher compressive strength. The maximum strength was attained by replacing cement by 10% alccofine and 30% glass powder.

S. M. Zubair and S.S. Jamkar (2015) conducted research which involves the use of Fly ash, Alccofine and Silica fume at different proportions to enhance the compressive strength of high performance concrete. They conducted experimental investigation by 10% fly ash along with 17% of alccofine and 10% fly ash along with 17% of silica fume by weight of cementitious binder s a partial replacement of cement. They concluded that alccofine performs better than that of silica fume together with fly ash in fresh and harden stages of concrete.

D. S. kumar, T. H. latha, N. S. Sri, T. Shobana and C. Soundarya (2015) conducted studies on the performance of M 50 grade concrete with partially replacing cement with alccfine at 10 % by weight. The mechanical & durability

examinations were conducted and found that the strength attained by the use of 10% alccofine showed greater to that of the nominal mix with 7 day and 28 days curing and the durability of the alccofine concrete is relatively higher than that of nominal mix.

V. Umamaheswaran, C. Sudha, P. T. Ravichandran and P. R. K Rajkumar (2015) conducted experimental investigation on replacement of cement by using mineral admixtures like GGBS, metakaolin, silica fume, alccofine and substitute of river sand with M-sand. From their investigation it was found that alccofine with M-sand showed 21% higher strength than the traditional concrete. The durability assessments like rapid chloride penetration, water penetration and drying shrinkage have been achieved acceptable results within permissible limit as per the codal provisions.

Ansari, Chaudhri, Ghuge N.P and Phatangre (2015) conducted an investigation on replacing cement by supplementary cementitious materials like alccofine and fly ash for M70 grade of concrete. In this research the compressive strength of concrete with alccofine, fly ash and the results are compared with normal concrete. From this investigation they observed partially replacing cement by alccofine the strength of concrete increased by 20%. It was found that alccofine is less expensive than cement and so it achieved higher strength than ordinary concrete, so it is recommended by them in Indian construction industry.

Rajesh K. S, A. Samanta and Singha Roy (2015) investigated the mechanical properties of concrete containing alccofine and concluded that alccofine will increase the strength in both compression and in flexure to a huge extent at 10% substitute level of cement. It is found that the strength development take place in concrete at all ages of curing. The strength increased rapidly at early age and after that increased gradually. If the proportion level of alccofine is extended beyond the limit it acts as a filler material and yields high workability to the concrete.

Siddharth. P and Jamnu M. A (2014) conducted experimental work on compressive strength of high performance concrete by replacing cement with alccofine, fly ash and natural sand with m-sand. They observed that by adding alccofine the strength has been increased rapidly at early stages then that of fly ash. The combination of fly ash-alccofine yielded better strength than that of concrete with fly ash and alccofine at all levels. The highest compressive strength is achieved by replacing cement at 10% alccofine and 30% fly ash. The addition of alccofine increases the self compatibility characters of concrete like filling and passing abilities, it also helps in resisting segregation.

Saurav and A. K. Gupta (2014) done experimental investigation about the partially replacing cement with ultra nice slag (alccofine).they found replacing cement with alccofine improved the workability and pump capacity of

concrete. The addition of alccofine enhances the hardened property of concrete by 13%. They concluded that replacing cement by 10% alccofine gave high strength then other mixes.

Y. H Patel, P.J.Patel, Prof. J. M Patel and H S Patel (2013) had done experimental investigation on durability properties of concrete by replacing cement with alccofine and fly ash. From the investigation they concluded that concrete incorporating alccofine and fly ash have better compressive strength compared to normal concrete. It is found that Alccofine improved the durability of concrete and decreased the chloride diffusion. it is determined that during accelerated electrolytic corrosion test loss of weight for steel in alccofine is much less, so in alccofine regular cover is sufficient to prevent steel from corrosion because of its pore filling and pore refining of particle.

Saurabh, Dr. Sanjay and Dr. Devinder (2013) have done investigation on strength of concrete containing alccofine and concluded that the use of alccofine as mineral admixture will increase the strength than traditional concrete. The concrete with alccofine shows higher workability and retain the workability for sufficient time. Alccofine can be easily mixed with cement and materials and It also helps in reducing the water/binder ratio.

D. Soni, S. Kulkarni and V. Parekh (2013) evaluated the performance of concrete containing supplementary cementitious materials like copper slag, GGBS, Alccofine and micro silica. From their analysis it is concluded that alccofine achieved better results when compare to other different types of slag and micro silica. Alccofine helps in improvement of workability of concrete. By increasing dosages of alccofine, they got better result on 8% of alccofine. They concluded that by using 6% - 8% of alccofine has an increased the strength properties when compared with traditional concrete.

M.S. Pawar and A.C. Saoji (2013) studied about the effect of alccofine on self compacting concrete (SCC) and they observed the behaviour of SCC with combination fly ash-alccofine and fly ash alone. The addition of alccofine to SCC mix improved the self compatibility characteristics and resistance to segregation. Fresh and harden properties of SCC with 10% alccofine are superior than all other mixes.

B. S. Sunil and B. O. Shah (2013) explained about the Strength development of high performance concrete containing alccofine at 8%, fly ash at 20% and the combination of alccofine- fly ash at 8% - 20%. The results of the investigation state that combination of alccofine-fly ash concrete has given more compressive strength at every age when compared to all other concrete mixes.

S. Suthar, B. K. Shah and P. J. Patel (2013) has done experinmental research investigation on compressive strength of Concrete by replacing of cement with various combinations of fly ash with alccofine and fly ash with silica fume. In

their investigation cement is replaced by weight with combinations of fly ash at 20 - 35% with alccofine at 4% to 14% and combinations of fly ash at 20 - 35% with silica fume at 4% to 14%. By their experimental investigation it is concluded that the combination of fly ash-alccofine increases the compressive strength at all age of the concrete than other mix.

3. Conclusion

The above review report provides brief information about effect of Alccofine as a partial replacement of cement in concrete. The use of Alccofine as replacement of cement increases the strength and durability of concrete at all of the age. If the replacement level of alccofine is above the optimum level it acts as a filler material and yields appropriate workability to the concrete. It is recommended to utilize the alccofine as a replacement material upto 20 %.

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