Journal of Engineering and Applied Sciences 13 (Special Issue 4): 3735-3736, 2018
ISSN: 1816-949X

Study on Structural Behaviour of Borosilicate Fiber in Concrete

J. Rajaraman
Department of Harbour and Ocean Engineering, AMET University, Chennai, India

Abstract: This study deals with experimental study and analysis of strength of borosilicate fibre reinforced concrete. Compressive and flexural strength of reinforced concrete prepared with different level mixture of borosilicate fiber is tested and analysed at 7, 14 and 28 days. Borosilicate fibers are used to partially replace the cement while making reinforced concrete. Different types of fibres are used in modern civil construction to improve the strength of concrete because the fibres are more economic and easily recyclable.

Key words: Borosilicate fibre, concrete strength improvement, compressive strength, experimental study, reinforced, partially replace

INTRODUCTION

There are many fibers like steel, glass, natural organic, mineral, polypropylene and synthetic fibers are used in partial replacement of cement in reinforced concrete. Borosilicate fiber is one of the glass fiber and this type of reinforced concrete is used in exterior building concealment panels. The precast concrete of cement reinforced with glass is thinner than cement reinforced with steel fiber. Compressive strength, flexural strength and toughness are few of the properties tested in fiber reinforced concrete (Wafa, 1990). Alkali resistant fibers are superior in performance compared to other fibers and have good tensile strength of about 1000-1200 N/mm^2 (Majumdar, 1974). To reduce the sensitivity of poor and non uniform water curing, special methods are suggested by Shah *et al.* (1987). The adverse effects of lack of water curing can be eliminated by the addition of polymer latex (Shah *et al*., 1987).

Since, glass fibers are used in front concealment panels resistance for fire is an important factor in design. The glass fiber reinforced concrete is having good resistance for fire (Balaguru and Shah, 1992). Fiber distribution orientation and bonding effectiveness are assessed and analysed by Swamy (1978) and it shows that the modulus of rupture and limit of proportionality in drying condition is higher than wet condition. Glass fiber reinforced concrete can be used as a structural material in telecommunication towers in combination with carbon and stainless steel fiber (Ferreira and Branco, 2007).

MATERIALS AND METHODS

M20 grade concrete was prepared using borosilicate fiber and sample specimens are prepared in the shapes of cubes and beams. Three set of samples each containing 3 cubes and 3 beams are prepared by varying the mixing percentage of borosilicate fiber. These samples are left few days for testing its compressive and flexural strength. Three sample sets are tested at 7th, 14th and 28th day and compressive and flexural strength of each sample are logged.

RESULTS AND DISCUSSION

Table 1 shows the compressive strength of cubes and Table 2 shows the flexural strength of beams taken at 7, 14 and 28 days. According to Fig. 1 and 2 the

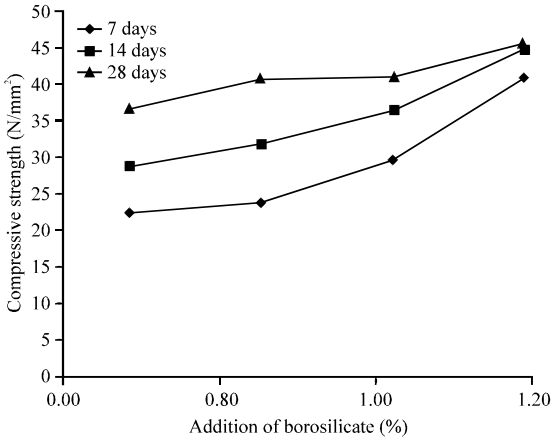

Fig. 1: Compressive strength of cubes of different samples

Table 1: Compressive strength (N/mm^2) of cubes

	Compressive strength (N/mm^2)		
Percentage	7 days	14 days	28 days
0	22.44	28.77	36.61
0.8	23.72	31.64	40.67
1	29.64	36.40	44.47
1.2	30.86	40.88	45.59

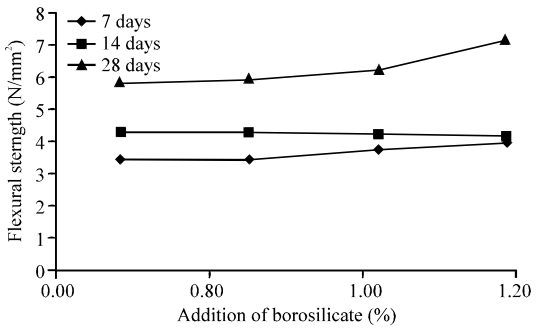

Fig. 2: Flexural strength of beams of different samples

Table 2: Flexural strength (N/mm^2) of beams

	Flexural strength (N/mm^2)		
Percentage (%)	7 days	14 days	28 days
0	3.46	4.28	5.86
0.8	3.43	4.32	5.88
1	3.74	4.21	6.23
1.2	3.95	4.15	7.18

compressive and flexural strength are increasing while increasing the mixing percentage of borosilicate and reaches maximum value in 1.2% mixing. There exists good difference between the strengths of borosilicate fiber reinforced concrete and normal concrete.

CONCLUSION

The mix design was prepared for the M20 grade concrete with addition of borosilicate fibre with various percentages in concrete. The specimens were casted tested. The maximum flexural strength for partial replacement of fine aggregate with borosilicate fibre be achieved at 1.2 is found to be greater than the conventional concrete. It achieved maximum compressive strength when there is addition of borosilicate fibre (1.2%). So, the optimum percentage of addition of borosilicate fibre is 1.2%.

REFERENCES

Balaguru, P.N. and S.P. Shah, 1992. Fibre Reinforced Cement Composites. McGraw-Hill, New York, USA., ISBN:9780070564008, Pages: 530.

Ferreira, J.G. and F.A. Branco, 2007. Structural application of GRC in telecommunication towers. Constr. Build. Mater., 21: 19-28.

Majumdar, A.J., 1974. The role of the interface in glass fibre reinforced cement. Cem. Concr. Res., 4: 247-268.

Shah, S.P., J.I. Daniel and D. Ludirdja, 1987. Toughness of glass fiber reinforced concrete panels subjected to accelerated aging. PCI. J., 32: 82-99.

Swamy, R.N., 1978. Testing and Test Methods of Fibre Cement Composites. Books on Demand GmbH, Norderstedt, Germany, ISBN:9780608307213, Pages: 555.

Wafa, F.F., 1990. Properties and applications of fiber reinforced concrete. Eng. Sci. J., 2: 79-63.