Experimental Study on Compressive Strength and temperature Evolution of High Performance Fiber Reinforced Concrete

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Abstract: Fire is one of the most frequent disasters in daily life. High temperature will cause many adverse effects on concrete, such as mechanical properties reduction, microstructure damage and so on. Re alkalization technology is one of the effective ways to repair the damaged concrete after high temperature. In this paper, the mechanical properties, size effect and constitutive relationship of typical high-performance concrete after re alkalization repair are studied through a large number of experiments.

1. Introduction

Fire is one of the greatest inventions in the history of human development. Since ancient times, people have used the fire of nature. The invention of man-made fire eventually separated people from the animal kingdom and led to independent development. With the development of society, fire is more and more indispensable to people's life. However, fire will also have a bad impact on people's lives. Fire will not only bring great influence to our daily life, but also threaten our life sometimes. Therefore, it is very important to study the method of repairing reinforced concrete effectively after fire. At present, remarkable achievements have been made in the research of building fire prevention, performance evaluation of post fire structures and post fire reinforcement and maintenance[1]. By investigating the performance of reinforced concrete after fire, defining the law of deterioration, evaluating the practicability of specific structure, adopting reasonable and scientific maintenance and reinforcement methods to repair and strengthen, the loss after disaster will be minimized. In recent years, more and more attention has been paid to this topic.

2. Study on Macro Mechanical Properties of High Performance Concrete after High Temperature

The compression strength of HPC after overseas research on HPC was implemented decades ago, and the domestic research on HPC started gradually after the reform and opening up. These studies are inseparable from the mechanical properties of high-strength concrete. In this study, the maximum pressure of the standard sample per unit area is the compressive strength of the corresponding concrete. The compressive strength is often used as an important evaluation index in the determination of concrete grade. The high temperature mechanical properties of Zhiwu concrete are analyzed and studied in detail. As an experimental research object, two kinds of ordinary concrete with strength gradient C 40, C 50, C 80 and other high performance concrete are selected. The effect and change of mechanical properties under different temperature and certain temperature were investigated. In addition, the effects of different cooling methods and sizes on the mechanical properties of C 80 high performance concrete are also studied[2]. As a result, the correlation between the compressive strength and the elastic coefficient of concrete, and the correlation between the temperature and a certain temperature and time, that is to say, to make the temperature rise and the time increase, the decrease of the compressive strength and the elastic coefficient of

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concrete shows the water, and the cooling has a great influence on the high-performance concrete cube compared with the natural cooling. At a certain temperature, the larger the volume of the cube, the greater the loss of compression strength. With the rise of temperature, the mechanical properties of concrete gradually aged after high temperature, which has a great impact on the safety performance of buildings. In recent years, reuse maintenance technology as a more effective repair method has been verified. Rehydration repair technology is that ordinary concrete can not only recover itself, reduce the surface activity of steel bar, and make it unable to be dynamic again[3]. The purpose of realizing the repair is based on most research results. However, it is necessary to further study whether the re alkalization repair of fiber reinforced concrete damaged after high temperature will have an effective effect.

Figure 1 Concrete pouring

Table 1 Concrete mix proportion

Water binder ratio	Cement	Sand	Gravel	Water	Fly ash	Water reducing agent	PVA fiber
0.26	486	543	1103	150	97	9.3	1.0

3. Research Findings

With the increase of heating temperature, the loss of compression strength and separation tensile strength of 100 mm and 150 mm PP fiber reinforced concrete increases. After practical application, the compression strength and cracking of concrete will be greatly improved after high temperature. Tensile strength. the higher the heating temperature of PP fiber reinforced concrete is, the greater the influence of the compressive strength and fracture strength after granulation is. The concrete test plot with side length of 100 mm is alkalized at 300 ℃ ~ 700 ℃. After 7 days of maintenance, the compressive strength recovered to 95.76%, 86.57%, 78.82%, 65.91%, 53.93%, and the tensile strength recovered to 81.76%, 73.11%, 62.41%, 51.71% of the normal temperature strength. 29.36%. The compression strength of 150 mm side concrete test block is 95.23%, 83.84%, 74.45%, 60.65%, 46.58%, which can not be recovered. The tensile strength can be restored to 80.62%, 62.61%, 45.28%, 35.68% and 19.73% of the normal temperature strength respectively. 3) in this study, the appropriate curves and formulas of the partition strength and temperature increase ratio of the concrete strengthened with different sizes of PP fiber after loading and high temperature are obtained, and the experimental results are summarized. (4) the total pore volume of PP fiber reinforced concrete increases after high temperature, and the pore diameter increases, which is close to the size movement of harmful porous polymer, and the compressive strength and crack strength decrease. This is helpful for the repair of the compression and partition properties of concrete. Polyvinyl alcohol (PVA) fiber is a kind of synthetic fiber material which has high strength and high elastic coefficient[4]. PVA fiber not only has mechanical properties, acid, alkali resistance and dispersion, but also has less quantity, low permeability and weather resistance. It is reported that PVA fiber has an important influence on the high temperature cracks and residual mechanical properties of jiangyuchuan high temperature superconductor. In depth analysis, 450 ° C has limitations and high-strength concrete fracture. When high-strength concrete is mixed with 0.10% and 0.2% PVA fiber, the fracture of high-strength concrete can be effectively improved. Polypropylene (PP) fiber is a kind of synthetic fiber. The compressive resistance can be improved

by adding a small amount of polypropylene fiber into the concrete every day. Scholar Zhao Jun et al. The explosion-proof mechanism of concrete at 200℃, 300 ℃, 400 ℃, 600 ℃ and 800 ℃ is analyzed. The results show that the compression strength, expansion strength and bending strength of the polypropylene fiber mixed with high strength concrete decrease with the rise of temperature[5]. Compared with ordinary high-strength concrete, the compressive strength, tensile strength and bending strength of polypropylene fiber high-strength concrete are improved under various temperature conditions. Especially, the strength of each index of high-strength concrete with polypropylene fiber drops sharply when it reaches 800 ° C, and the test piece of high-strength concrete breaks.

4. Splitting Tensile Strength of High Performance Concrete after High Temperature

The tensile strength of the concrete represents the maximum tensile strength of the test specimen at the time of fracture after receiving the tensile force. Specifically, it shows the main tensile strength in three aspects: tensile strength, tensile strength and bending strength. It is found that different types of fiber reinforced concrete have different tensile strength. By comparing and analyzing the influence of fiber volume ratio and size effect on fiber reinforced concrete, a special formula for calculating tensile strength is established. The results show that the larger the fiber volume ratio is, the greater the flexural strength is. When the volume ratio of polypropylene fiber mixed in concrete reaches 0 ~ 1.2kg/m 3, the side length is 100m m. The split tensile strength range of 150 mm test piece and test piece is 0.83 ~ 1.26 and 0.84 ~ 1.13, respectively. Xu Xiao, the strong relationship between the residual shrinkage of ordinary concrete and high-strength concrete at 200 ℃, 400 ℃, 600 ℃ and 800 ℃. As a result, the expansion loss of high strength concrete is more important than that of ordinary concrete in the range of 200 ℃ to 400 ℃. The results show that the high strength concrete shows better splitting tensile strength after mixing 8mm polypropylene fiber. When the polypropylene fiber reaches 2.5 kg / m, the tensile strength of PP fiber concrete decreases continuously with the rise of temperature[6]. The concrete strength after 91300 ℃ ~ 700 ℃ to the representative high-performance concrete after the high-temperature compression 92 size effect coefficient ceremony the re segmentation alkalization maintenance and the expansion strength size effect pair system formula the compression strength after the repair, the maintenance size segmentation effect system formula and the expansion strength formula require the size effect system. The results show that the stress-strain curve of the concrete strengthened by PP fiber, which has undergone re alkalization repair after different temperatures and after high temperatures, usually only has the rising part of the curve, and it will break directly after reaching the peak value. The stress-strain curve of the damaged concrete sample rises higher after re alkalization. Later, there was almost no descent part, and the test piece broke suddenly[7]. The formula of peak stress, deformation, elastic coefficient and Poisson's ratio of PP fiber reinforced concrete in high temperature and high pressure area is given. The formula of Poisson's ratio is given as a function of temperature. In this chapter, all the sliding failures, i.e. the high temperature damage of the microstructure of the rebalancing treatment of the single beam test results in the shape of the curve of bond after the rebalancing treatment, and the non alkali treatment is almost the same. The yield strength and final strength of the reinforcement increase, and only the rebalancing does not affect the reinforcement. The damage load and peak stress of the beam increase to a certain extent[8]. The compressive strength of ordinary high-strength concrete, PVA fiber-reinforced concrete and PP fiber-reinforced concrete after high-temperature damage is obviously repaired by re alkalization. The higher the heating temperature is, the more remarkable the effect of re alkali repair on the compressive strength of concrete is. On the basis of the test, after high temperature reheating, the adjustment curve of compressive strength repair of ordinary strength concrete, high strength concrete, PVA, PP fiber reinforced concrete is established.

5. Conclusion

Although limited by objective factors such as time and capacity, several aspects of

polypropylene fiber reinforced high-strength concrete are still under study. Electrolysis, electroosmosis, electrochemistry, adsorption, diffusion and so on are important aspects of the practical repair process. However, the influence of these factors and the role of various factors in the reversal process have not been discussed, so it is necessary to study them in the future[9]. After high temperature, there are oxide coated steel bars in the concrete. Alkali repair affects the surface state of the steel, reduces the activity of the steel surface, or does not make it dynamic again. Whether it needs further research and verification. In this report, only the bonding properties of HRB 335 reinforced PP fiber reinforced concrete after granulation treatment are studied. The temperature range of the study is too small, so more perfect tests are needed. The technology of re alkalization repair limits the application of re alkalization technology in practical engineering. It is necessary to improve the process and import new process.

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