

# EXPERIMENTAL STUDY ON SELF-HEALING CAPABILITY OF FRCC WITH DIFFERENT FIBER TYPES AND SHAPES

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## ABSTRACT

To maintain the global environment and build a sustainable society, highly durable and long-life concrete structures are strongly required. However, cracks in concrete cause various problems of not only aesthetic aspect but also durability, i.e. ingress of active substances.

On the other hand, even normal concrete has potential for self-healing of crack with small crack width in the presence of moisture. This self-healing process is induced by the precipitation of calcium carbonate crystals, which combine the dissolved  $\text{CO}_3^{2-}$  and  $\text{Ca}^{2+}$  in water with each other. The precipitated crystals cover and close the crack surface.

According to the author's previous studies, FRCC (Fiber Reinforced Cementitious Composite) has a great potential for self-healing than the normal concrete. That is because FRCC has mechanical characteristics which can control propagation of a crack width in the cement matrix through bridging with fibers. Additionally, it has been revealed that some types of synthetic fibers can accelerate the self-healing capability of FRCC due to its chemical properties. The FRCC reinforced by fibers with polar groups, such as polyvinyl alcohol (PVA) with hydroxy group, showed better performance of self-healing than fibers without polarity, such as polypropylene (PP). However, such self-healing phenomena have been experimentally confirmed only in the unrealistic condition, i.e. specimens were completely immersed in water. Therefore, observation of self-healing effects in a practical condition, i.e. a wet-dry cyclic condition will be valuable to develop it to practical application.

In this study, experimental studies were carried out under the wet-dry cyclic condition using different types of fibers, e.g. PVA, PP and PP with a deformed section (D-PP). As a result, it was confirmed that self-healing products filled up the crack with a width of 50 $\mu\text{m}$  in specimen of PVA and D-PP, even in wet-dry cyclic condition.