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Study on Resistance to Salt Damage of Mortar Containing Ground Granulated Blast-Furnace Slag

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Extended Abstract

Concrete structures are generally reinforced with steel bars within the concrete to compensate for the weak tensile strength of the concrete. However, the presence of chloride ions above the critical concentration near the rebar induces corrosion of the rebar, resulting in salt-induced deterioration such as cracking of the concrete [1]. For this reason, the use of ground granulated blast-furnace slag, which has excellent resistance to salt damage, has been attracting attention. Previous studies have shown that ground granulated blast-furnace slag has a denser pore structure than ordinary Portland cement, and is more effective in inhibiting the penetration of chloride ions. In addition, the hydrate generated by the hydration reaction reacts with chloride ions that penetrate into the concrete to form fixed chlorides called Friedel's salts that do not contribute to rebar corrosion. Previous studies have confirmed that the smaller the water-cement ratio, the greater the resistance to salt damage. It has been confirmed that the finer the ground granulated blast-furnace slag added to the material, the better the salt shielding performance. It has also been confirmed that adding the same amount of ground granulated blast-furnace slag as that of cement results in higher salt damage resistance. In terms of curing methods, it was confirmed that submerged curing improved the salt damage resistance more than steam curing. Furthermore, it has been confirmed that salt damage resistance decreases as the curing temperature of steam curing increases [5]. However, the effects of curing conditions on the salt barrier performance and immobilization performance have not been verified. In this study, the effects of different pre-curing times on the salt barrier performance and immobilization performance of ground granulated blast-furnace slag of different powder content were examined. The effective diffusion coefficients of the salt shielding performance were found to be similar at all levels when the comparison was made at the preloading time. Therefore, the amount of pores inside the specimens is also considered to be similar. In terms of immobilization performance, the higher the powder content of the ground granulated blast-furnace slag the greater the amount of immobilization. This is thought to be because the higher the powder degree, the larger the specific surface area, and the greater the amount of reaction with chloride ions, the greater the amount of immobilization. In addition, a comparison of the immobilization amount by pre-preparation time showed that the amount of immobilization tended to be higher when the pre-preparation time was 3.0 hours. This is because the hydration reaction is accelerated with a longer preloading time, and the amount of hydrate generated was larger than that of the specimens preloaded for 0.5 hours, and the amount of immobilized material was also larger.

References

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