

Elucidation of Mechanisms of Deterioration of Concrete Caused by Chemical Attack of De-icing Salts and its Preventive Measures

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Elucidation of Mechanisms of Deterioration of Concrete Caused by Chemical Attack of De-icing Salts and its Preventive Measures

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07555134

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Allocation Type

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Section

試験

Research Field

土木材料・力学一般

Research Institution

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Research Abstract

With regard to the deterioration of concrete due to the chemical attack caused by de-icing salts, it was found that a high-concentration CaCl₂ was very aggressive towards Portland cement concrete, and its aggressivity became more severe at a low temperature than at a high temperature, while no sign of deterioration was observed in NaCl solution independent of both the temperature and the concentration of solution. The deterioration caused by the ingress of CaCl₂ solution seemed to be attributed to the dissolution of calcium hydroxide and the formation of complex salts. In the mortars incorporating mineral admixtures such as fly ash, blast-furnace slag and silica fume, the combined effect of a decrease in the content of calcium hydroxide and a reduced chloride ion permeability on the process of hydration of mineral admixtures effectively improved the resistance to calcium chloride attack. Furthermore, it was confirmed that the entrained air in concrete improved the resistance to the calcium chloride attack, but the reduced water : cement ratio had little influence at later stages of exposure time in a high-concentration CaCl₂ solution. Interestingly, a further deterioration accompanied by cracking was found to be caused by the repetitive drying and wetting in CaCl₂ solution.

With the regard to the deterioration of concrete due to alkali-silica reaction, in a reactive aggregate-bearing mortars with relatively low alkali contents, the promotion of their expansions in 1N NaCl solution was caused by a rise of OH⁻ ion concentration in pore solution. The increase in OH⁻ ion concentration in the pore solution was responsible for the intrusion of NaCl into the mortars containing a reactive aggregate.

Research Products (12 results)

All Other

All Publications (12 results)

- [Publications] 竹内勝信、川村満紀、鳥居和之: "自然環境下に暴露したコンクリートのアルカリシリカ反応による膨脹とひびわれ" コンクリート工学論文集. Vol. 6 No. 1. 11-19 (1995) ▼
- [Publications] Torii, K., Sasatani, T.: "Effects of Fly Ash, Blast-furnace Slag and Silica Fume on Resistance of Mortar to Calcium Chloride Attack" Proc. of 5th Intl. Conf. on Fly Ash, Silica fume, Slag, and Natural Pozzolans in Concrete, ACI SP-153. Vol. 2. 931-949 (1995) ▼
- [Publications] Sasatani, T., Torii, K.: "Chemical Attack of Deicing Salts on Portland Cement Concrete" Proc. of Intl. Conf. on Concrete under Severe Conditions Environment and Loading. Vol. 2. 1265-1274 (1995) ▼
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