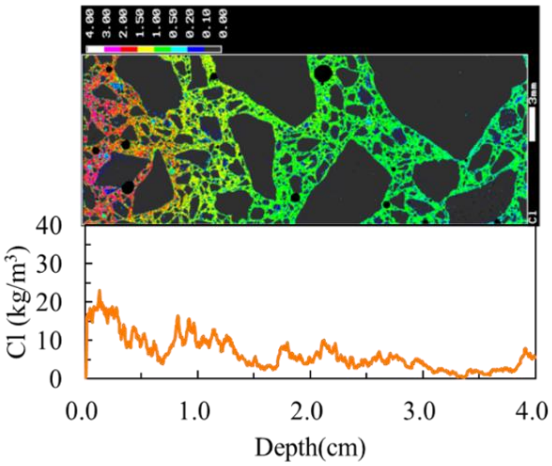

Fig. 2 (c) EPMA (HSC: 300°C)

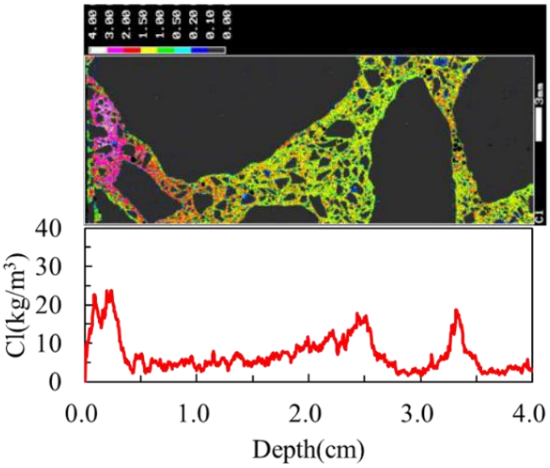

Fig. 2 (d) EPMA (HSC: 500°C)

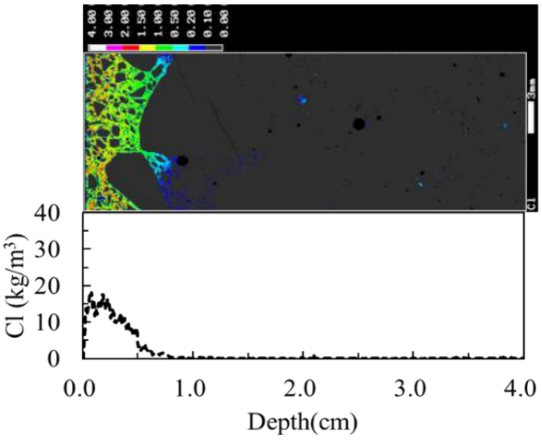

Fig. 2 (e) EPMA (HSC+PP: unheated)

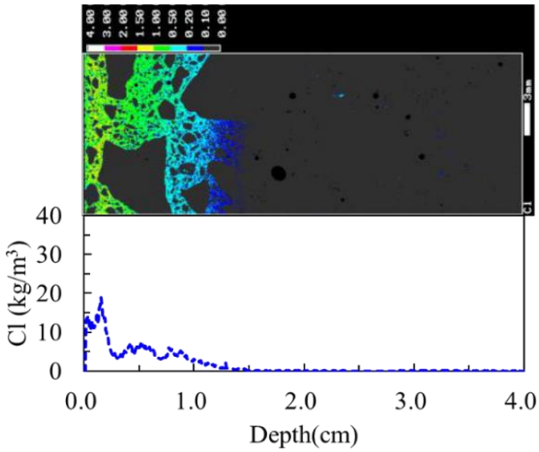

Fig. 2 (f) EPMA (HSC + PP: 100°C)

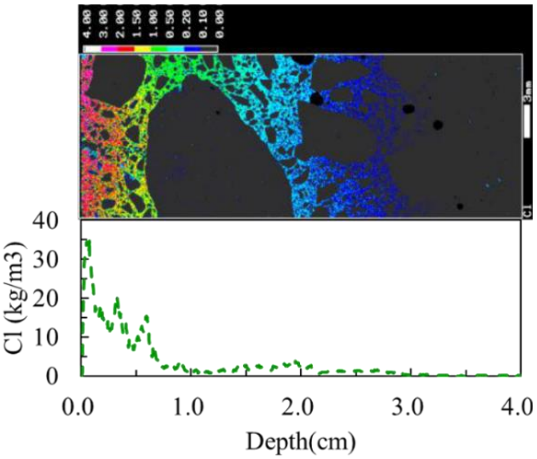

Fig. 2 (g) EPMA (HSC+PP: 200°C)

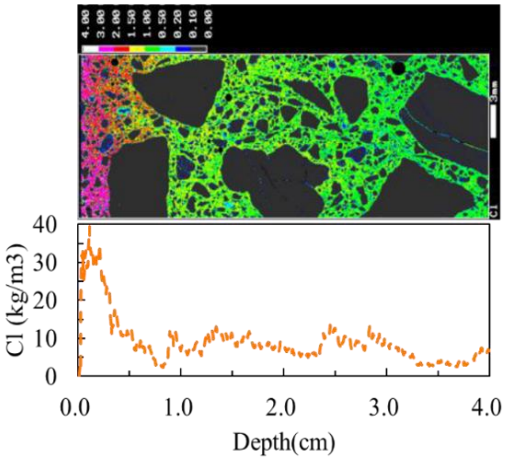

Fig. 2 (h) EPMA (HSC + PP: 300°C)

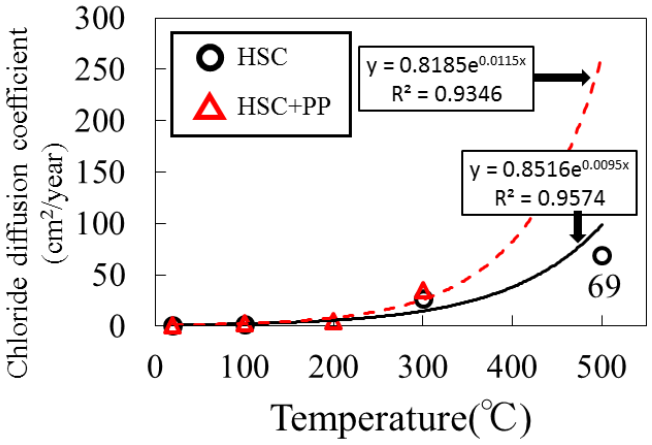

Fig. 3. Relationship between chloride diffusion coefficient and heating temperature for HSC without and with PP fibers

3. CHLORIDE PENETRATION ANALYSIS

Numerical analysis of chloride penetration in concrete after heating is based on the finite element method. Figure 4 shows a one-dimensional (1D) chloride penetration analytical model, and table 2 shows the conditions for calculation of chloride penetration. In the experiment using HSC with PP fibers, a sample with a thickness of 10 cm was heated to 300°C and subsequent chloride penetration at a point 10 cm from the heated surface was calculated. The measured initial chloride content at the surface of the specimen was 5 kg/m^3. The chloride diffusion coefficients with no heating and heating to 300°C were 1.135 and 35 cm^2/year, respectively. Figures 5 and 6 show the results of chloride penetration calculation for no heating and heating to 300°C. In unheated concrete, chloride penetration values after 1,000 days at depths of 3 and 10 cm from the surface were 1 and 0.2 kg/m^3, respectively, which are below the range of critical chloride content associated with steel corrosion. For the specimen heated to 300°C, the corresponding values exceeded 1.2 kg/m^3 (within the range of critical chloride content associated with steel corrosion) within 50 and 100 days, respectively. This indicates that the penetration resistance of concrete is impaired by exposure to heat. As a result, its post-exposure durability is reduced.

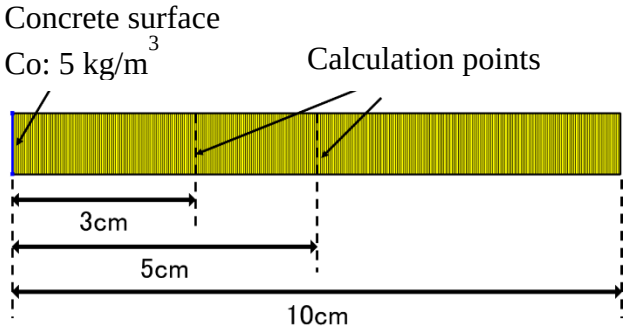

Fig. 4 One-dimensional analytical model for chloride penetration analysis

M. Collepardi, (1972), “Penetration of chloride ions into cement pastes and concrete,” J. Am. Ceram. Soc. 55 (10), 534-535