Large time behavior of a solution for carbon dioxide transport model in concrete carbonation process

Kota Kumazaki
Department of Natural and Physical Sciences, Tomakomai National College of Technology, Japan
k.kumazaki@gt.tomakomai-ct.ac.jp

In this talk, we consider the following initial boundary value problem (P) which is a mathematical model of carbon dioxide transport in concrete carbonation process:

$$\frac{\partial}{\partial t}[\phi(1-e^{-\int_0^t u(\tau)\mathrm{d}\tau})\cdot u]-\Delta u=-w_0 u e^{-\int_0^t u(\tau)\mathrm{d}\tau} \quad \text{in } (0,T)\times\Omega,$$
$$u=u_b \quad \text{on } (0,T)\times\Gamma,$$
$$u(0)=u_0 \quad \text{in } \Omega.$$

Here, Ω is a bounded domain of R^3 with a smooth boundary $\Gamma=\partial\Omega$, ϕ is a function in $\mathrm{C}^1(\mathrm{R})$ satisfying $\phi_0\le\phi(r)\le 1$ for $r\in\mathrm{R}$ where ϕ_0 is a positive constant, u_b is a given function on $Q(T)$, and w_0 and u_0 also are given functions on Ω. From the physical point of view, Ω is a domain occupied by concrete, the unknown function u and ϕ represent the concentration of carbon dioxide in air, and the porosity, respectively.

In [1], we proved the existence and uniqueness of a global solution of (P). In this talk, we show that the solution of (P) converges to a solution of the steady state problem, and moreover clarify the structure of the solution of the steady state problem considering two cases for boundary data.

References

[1] *K. Kumazaki*: A mathematical model of carbon dioxide transport model in concrete carbonation process. To appear in Discrete and Continuous Dynamical Systems-Series S.

[2] *K. Kumazaki*: Large time behavior of a solution of carbon dioxide transport model in concrete carbonation process. Submitted.