

Abstract:

We study a nonlinear diffusion equation with irreversibility condition in a bounded domain with Dirichlet or mixed boundary condition. Under some suitable conditions, we prove the unique existence of a strong solution and show its gradient structure, comparison principle, and longtime behaviour of the solution.

The construction of the strong solution is done through the backward Euler time discretization by using a regularity estimate of the solution of the classical obstacle problem. As an application of our equation, we show a phase field model for crack propagation in elastic media and its numerical simulation. This talk is based on joint works with Goro Akagi (Tohoku University) and with Takeshi Takaishi (Hiroshima Kokusai Gakuin University).