

Regularity of a solution to the many-dimensional free boundary problem for the porous medium equation, *Siberian Advances in Math*, 13 № 3 (2003), 1-53. (N.V. Krasnoschek).

Abstract

We examine the regularity of a solution of a free boundary problem for a nonlinear singular equation. The vector flux rate (which depends on the pressure gradient by Darcy's law) is equal to zero on the free boundary Γ_T . Their main result applies to the following moving free boundary problem:

$$\begin{aligned} p_t &= mp\Delta p + \frac{m}{m-1} |\nabla p|^2, \quad (y,t) \in \Omega_T, \\ p(y,0) &= p_0(y), \quad y \in \Omega_0, \\ \varphi(y',0) &= \varphi_0(y'), \quad y' = R^{n-1}, \\ p(y,t) &= p^*, \quad (y,t) \in \Sigma_T \end{aligned} \tag{1}$$

where p^* is an arbitrary constant, $\varphi(y') \geq \delta > 0$, $-\frac{\partial p_0}{\partial y_n} \geq \delta > 0$, and $y \in \Omega_0$.

We prove the one-valued solvability of problem (1) in Hölder classes.