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论文

BLOW-UP SOLUTIONS FOR A CLASS OF NONLINEAR PARABOLIC EQUATIONS WITH MIXED BOUNDARY CONDITIONS

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摘要 The type of problem under consideration is

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\left\{

\begin{array}{ll}

u_{t}=\nabla(a(u)b(x)\nabla u)+g(x,q,t)f(u)&in \ D\!\times\!(0,T),\\[1mm]

\displaystyle u=0 \ on \ {\it \Gamma}_1\!\times\!(0,T),~ \ \displaystyle

\frac{\partial u}{\partial n}+\sigma(x,t)u=0

\ on \ {\it\Gamma}_2\!\times\!(0,T), &{\it \Gamma}_1\!\cup\!{\it \Gamma}_2\!=\!\partial\!D,\\[2mm]

u(x,0)=u_0(x)\geq0, \ \not\equiv0&in \ {\overline D},

\end{array}

\right.

$$

where D is a smooth bounded domain of $R^N, \ q\!=\!|\nabla\!u|^2.$ By constructing

an auxiliary function and using Hopf's maximum principles on it, existence theorems

of blow-up solutions, upper bound of ``blow-up time'' and upper estimates of ``blow-up

rate'' are given under suitable assumptions on a, b, f, g, σ and initial date

$u_0(x).$ The obtained results are applied to some examples in which a, b, f, g and

σ are power functions or exponential functions.

关键词 Nonlinear parabolic equations, blow-up s

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Abstract The type of problem under consideration is $$ \left\{ \begin{array}{ll} u_{t}=\nabla(a(u)b(x)\nabla u)+g(x,q,t)f(u)&in \ D\!\times\!(0,T),\\[1mm] \displaystyle u=0 \ on \ {\it \Gamma}_1\!\times\!(0,T),~ \ \displaystyle \frac{\partial u}{\partial n}+\sigma(x,t)u=0 \ on \ {\it\Gamma}_2\!\times\!(0,T), &{\it \Gamma}_1\!\cup\!{\it \Gamma}_2\!=\!\partial\! D,\\[2mm] u(x,0)=u_0(x)\geq0, \ \not\equiv0&in \ {\overline D}, \end{array} \right. $$ where D is a smooth bounded domain of $R^N, \ q\!=\!|\nabla\!u|^2.$ By constructing an auxiliary function and using Hopf's maximum principles on it, existence theorems of blow-up solutions, upper bound of ``blow-up time" and upper estimates of ``blow-up rate" are given under suitable assumptions on a, b, f, g, σ and initial date $u_0(x).$ The obtained results are applied to some examples in which a, b, f, g and σ are power functions or exponential functions.

Key words Nonlinear parabolic equations blow-up solutions blow-up time blow-up rate maximum principles

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