ERRATUM

To the article “Existence and Uniqueness of a Regular Solution of the Cauchy-Dirichlet Problem for a Class of Doubly Nonlinear Parabolic Equations,” by A. V. Ivanov, P. Z. Mkrtychan, and W. Jager, Vol. 84, No. 1, 1997

A binding error occurred during printing. Page 851 of this article was incorrectly replaced by page 951 from another article in the issue. The correct page 851 appears here.

(4.1), (4.2) in the case $1 < m < 2$, $l \geq 0$ is almost the same as in the case $m \geq 2$, $l \geq 0$ in [8]. Lemma 4.2 is proved.

Remark 4.1. We can take $N = c_1$ for the function $\chi(u)$. By Lemma 4.2, we have the following identity for a generalized solution u of (RCD):

$$\vec{d}(\chi(u), \nabla u) = \vec{d}(u, \nabla u) \quad \text{a.e. in } Q_T. \quad (4.4)$$

Particularly, it follows from (4.4) that we can rewrite (RCD) as

$$\mathcal{F}[u] = f \quad \text{in } Q_T, \quad u = \psi + \varepsilon \quad \text{on } \Gamma_T. \quad (\text{RCD})$$

It follows now from (4.1), (4.3) that u is a strong solution of (RCD).

Lemma 4.3. *Let $u \in C([0, T]; L_2(\Omega))$ be a generalized solution of (RCD). Then there exist constants $\lambda \in (0, 1)$ and $K > 0$ independent of ε such that*

$$\langle u \rangle_{\lambda, \bar{Q}_T} \leq K. \quad (4.5)$$

Proof. By conditions (1)–(3), Remark 4.1, estimates (4.1)–(4.3), and Remark 3.1 we can apply either Theorem 3.1 or Theorem 3.2, i.e., establish (4.5) with some $\lambda \in (0, 1)$ and $K > 0$ independent of ε . Lemma 4.3 is proved.

To prove Theorem 4.1 we have to pass to the limit as $\varepsilon \rightarrow 0$.

§ 5. PASSING TO THE LIMIT

The arguments of this section are modifications of the justification of passing to the limit given in [8] for the case $m \geq 2$, $l \geq 0$. Unfortunately, in [8] the strict monotonicity condition

$$[\vec{d}(u, p) - \vec{d}(u, q)] \cdot (p - q) \geq \nu_1 |u|^l |p - q|^m \quad (5.1)$$

traditional for the case $m \geq 2$, was used. In the case $m \in (1, 2)$, $l \geq 0$ condition (5.1) is not natural, because it fails to be true for the main prototypes of Eqs. (1.1), (1.2). In this case condition (2) is natural. Use of condition (2) in the case $m \in (1, 2)$, $l \geq 0$ requires a more complicated justification of passing to the limit.

In this section we denote by u_ε a generalized solution of (RCD). We prove that some subsequence of $\{u_\varepsilon\}$ tends to a regular solution of (CD) as $\varepsilon \rightarrow 0$.

Since the estimates (4.1), (4.2), (4.5) are uniform, it follows from (4.3) that there exists a function u such that

$$u_\varepsilon \rightarrow u \quad \text{uniformly in } \bar{Q}_T, \quad (5.2)$$

$$\frac{\partial}{\partial x_i}(u_\varepsilon^{\alpha+1}) \rightarrow u^\alpha u_{x_i} \quad \text{weakly in } L_m(Q_T), \quad \alpha = \frac{l}{m}, i = 1, \dots, n \quad (5.3)$$

as $\varepsilon \rightarrow 0$. Moreover, we can derive the following estimates for the limit function u :

$$0 \leq \inf(u, Q_T) \leq \sup(u, Q_T) \leq c_1; \quad (5.4)$$

$$\sup_{t \in [0, T]} \int_{\Omega} u^2 dx + \iint_{Q_T} u^l |u_x|^m dx dt \leq c_2; \quad (5.5)$$

and (see (3.4))

$$\langle u \rangle_{\lambda, \bar{Q}_T} \leq K. \quad (5.6)$$

In (5.3) and (5.5) we used the following notation similar to (2.6):

$$u_x = (u_{x_1}, \dots, u_{x_n}),$$

$$u_{x_i} = \begin{cases} (\alpha + 1)^{-1} u^{-\alpha} \frac{\partial u^{\alpha+1}}{\partial x_i} & \text{on } \{Q_T : u > 0\} \\ 0 & \text{on } \{Q_T : u = 0\} \end{cases}, \quad \alpha = \frac{l}{m}. \quad (5.7)$$

Obviously, $u^\alpha u_{x_i} \in L_m(Q_T)$, $i = 1, \dots, n$ (in view of (5.5)). Because $\sigma = l/(m-1) > \alpha$, and the function u is bounded in Q_T , we can conclude that the expressions for u_{x_i} in (5.7) and (2.6) coincide; moreover, from the condition $u^\alpha u_{x_i} \in L_m(Q_T)$ it follows that $u^\sigma u_{x_i} \in L_m(Q_T)$.

We use below the following auxiliary propositions (see, for example, [8]).