

1125-35-2226

**Adam Louis Prinkey\*** (aprinkey2009@my.fit.edu), 3620 Misty Oak Drive, Apt 1507, Melbourne, FL 32901, and **Ugur G Abdulla** (abdulla@fit.edu), 150 West University Blvd, Melbourne, FL 32901. *Qualitative Properties of Solutions to Nonlinear Parabolic PDEs with Double Degenerate Fast Diffusion.*

We consider the problem of interface development and local behavior of solutions near the interface in the following Cauchy problem for the nonlinear double degenerate parabolic PDE with reaction and fast diffusion:

$$u_t = \left( |(u^m)_x|^{p-1} (u^m)_x \right)_x + bu^\beta, \quad x \in \mathbb{R}, \quad t > 0; \quad u(x, 0) = C(-x)_+^\alpha$$

The problem arises in applications involving turbulent filtration of material through a porous media. The interface behavior is determined by the competition between the diffusion and the reaction terms. The full solution for the reaction-diffusion equation ( $p = 1$ ) was given in 2002 [U.G. Abdulla, *Nonlinear Analysis: Theory, Methods and Applications*, 4, 2002, 541-560]. Our aim is to apply the methods of this paper to give a full classification for double degenerate reaction-diffusion equations with fast diffusion ( $0 < mp < 1; m, p > 0$ ). First we apply the nonlinear scaling method to identify which term dominates in the various regions of the  $(\alpha, \beta)$ -parameter space. We then construct super/subsolutions and apply special comparison theorems in irregular domains to prove explicit formulas for the interface and local solution, with precise estimations up to constant coefficients. (Received September 20, 2016)