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Ugur G Abdulla and **Amna Ali.S Abu weden*** (aabuweden2014@my.fit.edu). *Some Free Boundary Problems for the Nonlinear Degenerate Multidimensional Parabolic Equations Modeling Reaction-Diffusion Processes.*

This paper presents a full classification of the short-time behavior of the interface in the Cauchy problem for the nonlinear second order degenerate parabolic PDE

$$u_t - \Delta u^m + bu^\beta = 0, \quad x \in \mathbb{R}, t > 0$$

with nonnegative and radially symmetric initial function u_0 such that

$$\text{supp } u_0 \subset \{|x| < R\}, \quad u_0 \sim C(R - |x|)^\alpha, \quad \text{as } |x| \rightarrow R - 0,$$

where $m > 1, C, \alpha, \beta > 0, b \in \mathbb{R}$. Interface surface $t = \eta(x)$ may shrink, expand or remain stationary depending on the relative strength of the diffusion and reaction terms near the boundary of support, expressed in terms of the parameters $m, \beta, \alpha, \text{sign } b$ and C . In all cases we prove explicit formula for the interface asymptotics, and local solution near the interface. (Received July 30, 2017)