

**Vol. 14, No 1, 2005**

**Dynamics of Thermal Explosion in Porous Media–  
Gas Reagent–Solid Product Systems**

**K.G. Shkadinskii, N.I. Ozerkovskaya and A.G. Merzhanov**

*Institute for Problems in Chemical Physics, Institute for Structural Macrokinetics,  
Russian Academy of Sciences, Chernogolovka, Moscow Region, Russia  
e-mail: shkad@icp.ac.ru*

**ABSTRACT**

A complete solution of the unsteady-state filtration problem of thermal explosion incorporating the post induction period is given for the first time. The paper describes a study of the temperature-field dynamics, pore-gas pressure, and the degree of condensed-phase conversion versus reactive-gas deficiency in a reactive porous material. The focus is on the formation and propagation of frontal regimes of exothermic chemical reactions (their number, direction, velocity of propagation, and degree of condensed-phase conversion at the front). A surface regime of thermal explosion limited by gas filtration from the outside was considered. Regularities in the dynamics of the exothermic chemical reaction were found in the present study. The study revealed the ‘double self-ignitions’ phenomenon and combustion-wave propagation regimes with incomplete conversion at the front. The new direction of use of the thermal explosion is caused as a technological method for synthesizing inorganic systems.