

# Analysis and Simulation of Transient Combustion Processes in Inert Porous Media

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Combustion in an inert porous ceramics is an interesting alternative to the standard open flame burners for household gas heating systems. Advantages are e.g. lower contaminant emissions. The major problem is to design the burner such that there is a stable flame front well inside the device. We set up a model with the ingredients gas flow equation with Darcy-Forchheimer as constitutive law, reactive species transport equations and heat conduction/transport equations coupled via the gas law. For a slightly simplified version we perform a numerical bifurcation analysis for the onedimensional stationary case to back up general twodimensional transient simulations based on a mixed finite element discretization. The Darcy-Forchheimer gas flow problem is theoretically investigated leading to existence and uniqueness results for the continuous model and to order of convergence estimates for the mixed finite element discretization.