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Reacting Flow in the Entrance to a Channel with Surface and Gas-Phase Kinetics DAVID MIKOLAITIS, PATRICK GRIFFEN, University of Florida — In many catalytic reactors the conversion process is most intense at the very beginning of the channel where the flow is not yet fully developed; hence there will be important interactions between the developing flow field and reaction. To study this problem we have written an object-oriented code for the analysis of reacting flow in the entrance of a channel where both surface reaction and gas-phase reaction are modeled with detailed kinetics. Fluid mechanical momentum and energy equations are modeled by parabolic "boundary layer"-type equations where streamwise gradient terms are small and the pressure is constant in the transverse direction. Transport properties are modeled with mixture-averaging and the chemical kinetic sources terms are evaluated using Cantera. Numerical integration is done with Matlab using the function pdepe. Calculations were completed using mixtures of methane and air flowing through a channel with platinum walls held at a fixed temperature. GRI-Mech 3.0 was used to describe the gas-phase chemistry and Deutchmann's methane-air-platinum model was used for the surface chemistry. Ignition in the gas phase is predicted for high enough wall temperatures. A hot spot forms away from the walls just before ignition that is fed by radicals produced at the surface.

David Mikolaitis

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