OLATUNDE ABIDAKUN, V'YACHESLAV AKKERMAN, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV, 26506. Propagation of Nonequidiffusive Premixed Flames in Channels with Open Ends.

Oscillation and acceleration represent two distinct modes of premixed flame propagation in channels with open ends. The type of propagation encountered is determined by such factors as the internal condition of the channel, the width of the channel, the thermal expansion ratio, and the thermal-to-mass diffusivity ratio (defined as the Lewis number, *Le)*. We have therefore investigated the impact of these factors, especially, the *Le* and its coupling to other parameters, on the dynamics and morphology of premixed flames in fully-open channels. We computationally solved the set of reacting flow equations, including the balance of mass, momentum, energy and species, with fully-compressible fluid dynamics and Arrhenius chemical kinetics. Specifically, the Lewis numbers in the range $0.2 \leq Le \leq 2$ are considered. Other factors varied in the parametric study include the thermal expansion ratio $\Theta \equiv \rho_f/\rho_b = 5;\ 8; 10$; the channel half-width R, scaled by the flame thickness L_f, in the range $10 \leq R/L_f \leq 48$; the blockage ratio $0 \leq \alpha \leq 2/3$, and the spacing between neighboring obstacles ΔZ scaled by R, such that $\Delta Z/R = 1/4, 1/2, 1$. It is shown that *Le* provides both quantitative and qualitative effects on the flame. In some cases of the channels filled with obstacles, the flames show an oscillatory propagation, while in other cases, sudden transition to acceleration after an initial period of oscillation is seen. Without obstacles ($\alpha = 0$), the flames only exhibit oscillatory motion. All flame propagation parameters, such as the oscillation frequency, amplitude, and the time of initial propagation before transition to acceleration, are found to be affected by *Le* and other factors.