Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Flame-front kinematics in porous media analyzed via 2D simulations[1] EMERIC BOIGNE, SADAF SOBHANI, JOSEPH FERGUSON, MATTHIAS IHME, Stanford University — Combustion in porous media is characterized by strongly corrugated flame regimes and conjugate heat transfer. To quantify the flame regimes in these environments, 2D flame profiles within adiabatic porous media are investigated via pore-scale simulations. Premixed laminar methane-air flames are stabilized within 2D arrays of cylinders. Several cylinder configurations with varying degrees of regularity are simulated in order to evaluate the effect of porous media geometry on the flame stabilization. Flame-front corrugations are statistically analyzed, and theory is developed to explain the stabilization regimes observed computationally. Specifically, this work discusses the effects of flame stretching, normal, and tangential diffusion on local laminar flame speeds. Similarities between flame corrugation through obstacles and standard turbulent premixed flame theory are also highlighted.

[1]This work was supported by a Leading Edge Aeronautics Research for NASA (LEARN) grant (No. NNX15AE42A), a National Science Foundation award (No. CBET-1800906), and the National Science Foundation Graduate Research Fellowship (No. 1656518).

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Date submitted: 03 Aug 2020 Electronic form version 1.4