Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Pore-scale and topology analysis of flame stabilization inside inert porous media using X-ray microtomography[1] EMERIC BOIGNE, PRIYANKA MUHUNTHAN, DANYAL MOHADDES KHORASSANI, SADAF SOBHANI, Stanford University, DULA PARKINSON, HAROLD BARNARD, Advanced Light Source, MATTHIAS IHME, Stanford University — Synchrotron X-ray microtomography is used to perform gas-phase thermometry of a premixed flame burning within an inert porous media. Using a two-zone porous media burner, the flame is stabilized inside of a reticulated porous ceramic made of silicon carbide. The flame structure is visualized using a mixture of $Kr/O_2/N_2/CH_4$, where radio-dense Krypton is added to enhance the gas phase attenuation. Spatial resolution below 10 microns allows for the spatial characterization of the gas-phase temperature field at the pore scale. Taking advantage of the high photon count from the synchrotron source, effects of the combustion process on the thermal degradation of the solid ceramic are examined in detail. X-ray microtomography are also used to extract the topology of the entire porous media burners. Relevance of the ceramic geometric parameters for the combustion process are discussed. Analysis of different porosities and pore diameter profiles as well as different burner designs are correlated with the experimental performance of these burners.

[1]Leading Edge Aeronautics Research for NASA

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Date submitted: 31 Jul 2017 Electronic form version 1.4