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Flameless Combustion for Gas Turbines EPHRAIM GUTMARK, GUOQIANG LI, NICK OVERMAN, MICHAEL CORNWELL, University of Cincinnati, DRAGAN STANKOVIC, LASZLO FUCHS, VLADIMIR MILOSAVLJEVIC, Lund Technical University, UNIVERSITY OF CINCINNATI TEAM, LUND TECHNICAL UNIVERSITY TEAM — An experimental study of a novel flameless combustor for gas turbine engines is presented. Flameless combustion is characterized by distributed flame and even temperature distribution for high preheat air temperature and large amount of recirculating low oxygen exhaust gases. Extremely low emissions of NOx, CO, and UHC are reported. Measurements of the flame chemiluminescence, CO and NOx emissions, acoustic pressure, temperature and velocity fields as a function of the preheat temperature, inlet air mass flow rate, exhaust nozzle contraction ratio, and combustor chamber diameter are described. The data indicate that larger pressure drop promotes flameless combustion and low NOx emissions at the same flame temperature. High preheated temperature and flow rates also help in forming stable combustion and therefore are favorable for flameless combustion.

Ephraim Gutmark
University of Cincinnati

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