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Radiative cooling in a flameholder for NO_x reduction ROBERT BREIDENTHAL, University of Washington, IGOR KRICHTAFOVITCH, DOUG KARKOW, JOSEPH COLANNINO, ClearSign Combustion Corporation — Recent experiments have revealed dramatic reductions in NO_x emissions using a ceramic honeycomb as a flameholder. A jet of fuel entrains and mixes air before entering the honeycomb. The honeycomb is positioned at a distance away from the jet nozzle such that the mixed fluid arriving at the upstream edge of the honeycomb is combustible. Combustion occurs within the honeycomb, transferring heat to the ceramic walls, which glow red hot. According to a simple physical model, radiation and thermal conduction transport energy toward the upstream end of the honeycomb, thereby heating the incident cold reactants to maintain combustion. The radiation also transports energy downstream and away from the honeycomb, toward a thermal load. This is an attractive characteristic in boiler applications, for example. Furthermore, the hot combustion products in intimate thermal contact with the walls of the radiating honeycomb are rapidly cooled, consistent with the low NO_x emissions. Preliminary experiments with different honeycomb configurations are in accord with this model.

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