THE COMBUSTION OF LIQUID FUELS USING A POROUS MEDIUM

Authors : Sumrerng Jugjai, Narongsak Wongpanit, Thawatchai Laoketkan, Sorawut Nokkaew
Published : Experimental Thermal and Fluid Science, Vol. 26, No. 1, 2002, pp. 15-23

Present observations of the progress in liquid fuels combustion technology strongly suggest that utilization of a porous medium burner is a promising approach for future applications. The porous medium burner for liquid fuels is more advantageous than the conventional open spray flame burner for several reasons. These include enhanced evaporation of droplet spray owing to regenerative combustion characteristics, low emission of pollutants, high combustion intensity with moderate turndown ration and compactness. Existing designs of liquid fuel porous medium burners have typically relied on a spray atomizer with combustion flame contained within the porous medium. Against this background, a novel porous burner system was developed for burning kerosene without the need of using a spray atomizer. This burner system had and insulated porous medium burner section and a combustion chamber section, which is 80 mm in diameter. Kerosene was supplied dropwise to the top surface of the porous medium burner and burnt on the lower side where the swirling combustion air was supplied and mixed with the fuel vapor. Observations of evaporation mechanism and combustion characteristics occurring inside the burner system were investigated by measuring both axial and radial temperature profiles and emission characteristics. Interaction between the kerosene fuel and the porous medium burner was irradiated by thermal radiation from the downstream combustion zone enhancing the fuel evaporation. Stable combustion with low emission of pollutant was achieved at an equivalence ratio 0.37-0.55 at thermal input of 2.62-3.49 kW. The effects of various parameters including equivalence ratio, thermal input and downstream installation of the porous emitter on the combustion characteristic were clarified.