Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Microwave Plasma Assisted Combustion of Premixed Ar/CH_4 and He/CH_4 Gases at Atmospheric Pressure[1] CHUJI WANG, NIMISHA SRIVASTAVA, BURAK MALIK KAYA, Mississippi State University, MS — Low-temperature nonthermal plasma assisted combustion is of growing interest due to potential applications in the improvement of combustion efficiency, reduction of ignition delay time, fuel reforming, etc. A 2.45 GHz microwave plasma source was used to study the microwave plasma enhanced flame of premixed Ar/CH_4 and He/CH_4 gases at atmospheric pressure. We present the visual observations of the plasma-assisted flames sustained at different mixing ratios of Ar/CH_4 and He/CH_4 gases. Optical emission spectroscopy (OES) was employed to study the reactive species generated from plasma flame. Visual imaging clearly showed the effect of microwave power and difference in flame shapes created in the Ar/CH_4 and He/CH_4 combustion: for Ar/CH_4 continuous flames were observed; for He/CH_4 floating flames (flames sustained with an air-gap from the plasma orifice) were observed at low plasma powers and some particular gas mixing ratios of He/CH_4. Measured flame temperatures were much higher than plasma gas temperatures. Reactive species, such as OH, NO, N_2, and C_2, were observed using OES. Effect of various gas mixing ratios, flow rates, and plasma powers on flame shape and flame temperature were also studied.

[1]This work is supported by the NSF grant # CTS 062630.

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Date submitted: 15 Jul 2010 Electronic form version 1.4