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Cavity ringdown measurements of OH radicals in microwave induced argon plasma assisted combustion of methane/air mixtures[1] WEI WU, CHUJI WANG, Mississippi State University, LASER SPECTROSCOPY AND PLASMA TEAM — In order to study the mechanism of plasma assisted combustion, we have developed a system that injects a nonthermal low temperature atmospheric argon plasma into the burning flame of lean methane/air mixtures. The experimental results demonstrated the flammability enhancement of plasma assisted combustion in the lean flame of a fuel equivalence ratio as low as 0.2. In the argon plasma assisted combustion flame, we observed three different zones which were pure argon plasma zone, plasma-flame interacting zone, and pure flame zone. Optical emission studies showed distinct spectroscopic fingerprints of each zone. The emission intensities of OH radicals increased dramatically moving from pure plasma zone to plasma-flame interacting zone, and dropped severely from plasma-flame interacting zone to pure flame zone. In addition to the optical emission spectroscopy study, cavity ringdown spectroscopy (CRDS) was also applied in the measurements of absolute ground state OH radical number densities in the plasma assisted combustion flame. Results showed that the ground state OH radical number densities in the pure flame zone are on the order of 10^{15} molecule/cm^3, and increasing within the range of first few millimeters from the combustor nozzle.

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