Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Rotating arc plasma characteristics in the presence of methane flame NAKYUNG HWANG, Stanford University, DAE HOON LEE, KWAN TAE KIM, YOUNG-HOON SONG, Korea Institute of Machinery and Materials — Plasmas can ignite and stabilize flames under extreme conditions and have already been applied in practical combustors, but further studies are needed to elucidate the complex flame–plasma interactions. Here, we present the results of an experimental study on the interactions between a methane flame on a rotating arc plasma, with particular focus on the influence of flame conditions on plasma generation. A gas chromatograph, chemiluminescent NO_x analyzer, optical emission spectrograph, and intensified charge-coupled device were used to monitor product gases (CO_2, H_2, CO, C_2, C_3, and NO_x) with and without the plasma and also plasma characteristics (arc length, angular speed, and peak voltage) under different flame equivalence ratios Φ. The results confirmed that the rotating arc indeed stabilized the flame and extended both flammability limits. In addition, the rotating arc was pushed upward and out of the reactor for rich and lean mixtures. The highest NO_x concentration was obtained at the lower flammability limit in the presence of the plasma, but at $\Phi = 1.0$ without the plasma.

Nakyung Hwang
Stanford University

Date submitted: 19 Jun 2012 Electronic form version 1.4