

Abstract Submitted
for the GEC05 Meeting of
The American Physical Society

Optical Emission Spectroscopy of an Atmospheric Arc RUSSELL

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An arc plasma was generated in atmospheric air between two carbon electrodes powered by a high voltage transformer controlled by a variable input source. A voltage of up to 12,000 V and current of 30 mA was delivered to an arc about 1.5 cm long. The diameter of the arc is estimated to be 0.1 cm, giving a current density of 4 A/cm². Optical emissions spectroscopy from 250 nm to 800 nm revealed a variety species ranging from molecular species like OH and N₂⁺ to atomic lines of oxygen and nitrogen. When the arc is first ignited, molecular lines dominate while atomic lines begin to grow in intensity the longer the arc runs and as the gas heats up. Thermal equilibrium calculations between nitrogen atoms and molecules suggest that the plasma gas temperature is no more than 4500 K. The electron density is estimated to be about 10¹² #/cm³ based upon the relationship between current density and electron density in Ref. [1]. The spectral evolution of the discharge as a function of time will be discussed with respect to heating mechanisms. [1] Lan Yu et al., J. Appl. Phys., 91(5) 2678, 2002

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Date submitted: 13 Jun 2005

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