Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Non-equilibrium electron energy distribution in oxygen plasma: observation with optical emission spectroscopy[1] JOHN BOFFARD, NATHANIEL LY, SHICONG WANG, COLIN SWEE, CHUN C. LIN, AMY WENDT, University of Wisconsin-Madison — Partially ionized inductively-coupled RF oxygen plasmas are in widespread use for materials processing, and non-invasive diagnostics are of interest for the optimization and control of the degrees of ionization and dissociation. Our initial study involves a 2-5% admixture of argon for optical emission spectroscopy (OES) of the oxygen plasma glow. The Ar 420.1/419.8 nm line intensity ratio, previously used in other mixtures to compute electron temperature, when < 1, is also an indicator of a significant population of high energy (> 35 eV) electrons;[2] the latter is observed under conditions of low power and high pressure in the oxygen plasma. We tentatively attribute the increase in energetic electrons to a transition to capacitive coupling, leading to electron acceleration to high energy in the sheaths adjacent to the powered electrode, which in this system is a spiral flat antenna separated from the plasma by a dielectric window. Investigations of OES methods involving additional species, including other trace rare gases,[3] O, and O_2^+, to determine oxygen plasma properties such as non-Maxwellian electron energy distributions will also be described.

[1]Supported by NSF Grants PHY-1617602 and PHY-1068670
[2]J. B. Boffard *et al.*, PSST **24** (2015))
[3]V. M. Donnelly, J. Phys. D **37** (2004).

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Date submitted: 13 Sep 2017 Electronic form version 1.4