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Comprehensive Plasma Diagnostics of Oxygen ICP[1] THOMAS WEGNER, CHRISTIAN KÜLLIG, JÜRGEN MEICHSNER, University of Greifswald — A planar inductively coupled 13.56 MHz discharge (ICP) in pure oxygen was studied using comprehensive plasma diagnostics. In particular the 160 GHz Gaussian beam microwave interferometry, the Langmuir probe technique, the phase resolved optical emission and VUV absorption spectroscopy were applied. During the transition from the capacitive (E-) to the inductive (H-) mode all plasma parameter are changed. The E-mode at low electron density and high electron temperature is characterized by high electronegativity. The gas temperature is comparable to room temperature and the molecular oxygen ground state and metastable state ($O_2\,(a^1\Delta_g)$) density are not significantly changed with increasing RF power in the E-mode. During the transition into the H-mode the electron density increases over two orders of magnitude whereas the electron temperature decreases to about the half of the E-mode. The heating mechachnisms change from the rf sheath heating and electrical field reversal in the E-mode to two excitation rate patterns in the first and second half of the RF cycle. In the H-mode, the electronegativity is strongly reduced, the gas temperature and the metastable density are increased by a factor of about two.

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