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Comparison of Model and Experiment for Ar/O_2 Inductively Coupled Plasmas C.C. HSU, M.A. NIERODE, J.W. COBURN, D.B. GRAVES, University of California at Berkeley — A detailed comparison has been made between measurements and a fluid model of an inductively coupled plasma in mixtures of argon and O_2. Measurements include electron density, electron energy distribution function, positive ion wall flux and composition, and O, Ar and O_2 densities measured at the chamber wall. The inductively coupled power ranged from 150 to 500W, the pressure from 5mT to 80mT, and the O_2/(Ar+O_2) inlet flow rate ratio varied from 0 to 1. The overall gas flow was kept at 33.5sccm. Model equations are solved with a commercial finite element package (FemLab^{TM}). The fluid model is shown to capture all trends in mean electron energy, neutral densities and the positive ion flux to the wall, as well as the electron density radial profile over the conditions investigated. The model predicts that the O_2-containing plasmas are weakly electronegative over the conditions studied. The measured eepf is nearly Maxwellian at high O_2 concentrations, and under these conditions the model prediction for T_e are in good quantitative agreement with measurements. The stainless steel chamber walls are effective for O recombination, resulting in relatively low degrees of dissociation and strong gradients in O atom concentration, even at the lowest pressure. Model limitations will be discussed.

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