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Inductively-coupled plasmas in pure Cl, Oand mixtures: measurements of atoms, $Cl_xO_y$and electron densities MICKAËL FOUCHER, LPP-CNRS UMR 7648, EMILE CARBONE, CEA grenoble, JEAN-PAUL BOOTH, PASCAL CHABERT, LPP-CNRS UMR 7648, LPP-PLASMAS FROIDS TEAM — Inductively-coupled plasmas in Cl/O(often with HBr) are widely used in the microelectronics industry for the etching of silicon CMOS gates. Many simulations describing these plasmas (global and 2-dimensional fluid models such as HPEM) have been developed but experimental validation is sparse. This paper addresses this gap with a large quantity of experimental data in plasmas of Cl, Oand their mixtures. The plasma is excited by a 4-turn planar coil powered at 13.56 MHz through a dielectric window, and contained in a cylindrical anodized aluminium reactor (55 cm diameter, 10 cm high). Electron densities were measured with a microwave hairpin resonator. In all cases the electron density passes through a maximum with pressure. The ground-state O and Cl atom density was measured by Two-Photon Absorption Laser-Induced Fluorescence (TALIF) combined with specific absolute calibration techniques. Broad-band absorption spectroscopy was used to measure the density of Cland vibrationally excited Omolecules, excited state Cl atoms and a range of oxychlorides products. To our knowledge this is the first time that these oxychloride densities and vibrationally excited molecules have been measured in low-pressure plasmas.

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