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F^- detection by CRDS in a dual-frequency capacitive plasma in $Ar/C_4F_8/O_2$ CORMAC CORR, GARRETT CURLEY, JEAN-PAUL BOOTH, LPTP, Ecole Polytechnique, 91128 Palaiseau, France — Dual-frequency capacitively coupled plasmas in Ar/fluorocarbon mixtures are widely employed for etching of holes in SiO_2-based dielectrics in integrated circuit manufacture. Negative ions can dominate the structure and dynamics of discharges if their density is high enough, yet no experimental data is available for dual-frequency plasmas. They may also play a role in etching if they can reach the surface. The determination of the negative ion density via the detection of photo-detached electrons is difficult to implement in such reactors due to the large RF fluctuations of the plasma potential. Therefore we have implemented the cavity ring-down spectroscopy (CRDS) technique to measure the density of fluorine negative ions in a customized industrial dual-frequency capacitive etch reactor operating with $Ar/C_4F_8/O_2$. A pulsed laser beam from a tuneable dye laser was scanned over the wavelength range 340 to 360 nm and injected into an optical cavity formed by two high-reflectivity concave mirrors (> 99.95 %). The temporal behaviour of the decaying pulse at the cavity exit allows the density of absorbing F^- ions to be determined from the known photo-detachment cross-section. The negative ion density will be investigated as a function of input power and gas mixture.

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