Some aspects of dissipation mechanisms in chlorine containing capacitively coupled discharges

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The temperature of gaseous neutrals in capacitively coupled discharges of chlorine, argon, and hydrogen has been measured using optical emission spectroscopy. This has been accomplished by adding small amounts of nitrogen to the ambient. The temperature can then be obtained by fitting the unresolved second rotational positive band of nitrogen. It has been found that the gaseous temperature in argon saturates for higher pressures logarithmically, whereas in chlorine, a linear behavior is observed up to the highest pressures and power inputs. Highest temperatures in chlorine have been found to be about 1100 °C, whereas in hydrogen, temperatures higher than 500 °C are rarely observed. Likewise, the effective collision frequency in chlorine increases significantly in the medium pressure range indicating a change in excitation/dissipation from the regime of stochastic heating to Ohmic heating, whereas the discharge in the inert gas still remains in the regime of stochastic heating. The experimental data for the collision frequency of the electrons with neutrals can be perfectly modeled for chlorine with these reduced gaseous densities. [DOI: 10.1116/1.2198861]