Abstract Submitted
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Chlorine atom measurements in Ar:Cl_2 discharges. F.G. MARRO, Queen's University Belfast, Northern Ireland, W.G. GRAHAM, Queen's University Belfast, Northern Ireland — Two-photon Laser Induced Fluorescence has been used to measure the chlorine atom density in an inductively coupled discharge. A 233.3nm beam was focused into a 130μm waist 2-3 cm above the lower electrode pumping the ground state $3s^2 3p^5(^2P^0_{3/2})$ to the excited level $3s^2 3p^4 4p(^4S^0_{3/2})$. From the three radiative decay channels at 725.6, 754.7 and 774.5nm, the strongest one, 725.6nm, was monitored. The UV photons were obtained from mixing an Nd:YAG fundamental (1064nm) and the second harmonic of a DYE laser. Relative and total measurements were performed in pure chlorine and in Ar:Cl_2 mixtures. A calibration based on CCl_4 photolysis was used. The estimated dissociation shows values as high as 33% near the transition between the capacitive and the inductive coupling. An unexpected decay of the atom density with power was observed in the inductive mode. The dependence of the atom density as chlorine is introduced into an argon discharge is linear. Doppler broadening was estimated from the lineshape, suggesting that the atomic temperature rises a few hundred Kelvin in the inductive mode. A kinetic model has been developed which shows that gas heating and the surface recombination coefficient have an important effect on the dissociation.

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