Analysis of chlorine-containing plasmas applied in III/V semiconductor processing*

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Capacitively coupled discharges of strongly reactive atmospheres containing mixtures of boron trichloride and chlorine are investigated with optical emission spectroscopy and self-excited electron resonance spectroscopy. This analyzes the whole area spanned by these gases and their impact on important plasma parameters like plasma density, electron temperature, and electron collision rate with neutrals. Using these data, roughly calculated cross sections for these gases are obtained in the low-energy region. Molecular chlorine ions, Cl_2^+, are evidently present to a preponderant amount as a main agent, which are accompanied by chlorine radicals, Cl(I), in mixtures with chlorine. Absolutely no chlorine ions could be found in the plasma which referred to the effective cooling of the Cl-containing species rather than the nonexistence of these species.
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