

Density and temperature of Ar(4s) in an argon surfatron plasma measured by laser absorption spectroscopy

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This study presents the absolute argon 1s (4s) densities obtained in a surfatron plasma in the pressure range $0.65 < p < 105$ mbar. The absorption signal of two Tunable Diode Lasers (TDL) was employed for that, probing the levels $1s_3$, $1s_4$ and $1s_5$. When operated in wavelength scanning mode the line shape is obtained, thus T_g . At gas pressures of $p < 10$ mbar Doppler broadening dominates the line profile, while for higher pressures the line profile fitting is composed of pressure induced and Doppler broadening. Scanning the pressure range and the electron density range of $5 \cdot 10^{18} - 10^{20} \text{ m}^{-3}$ gives results of Ar(4s) densities that are in the order of $10^{16} - 10^{18} \text{ m}^{-3}$. The 4s densities decrease with pressure, while the gas temperature (T_g) is increasing with pressure in the range of 480-750 K. The relatively high 4s densities are compared to a detailed CRM. That is done successfully, under the condition that the electron temperature as an input parameter for the CRM is precisely known. T_g was compared to previous Rayleigh scattering measurements. Taking into account line of sight effects of the TDL measurements good agreement for the gas temperature is found.