Plasma Parameters of MSE Sustained High Pressure Glow Discharges

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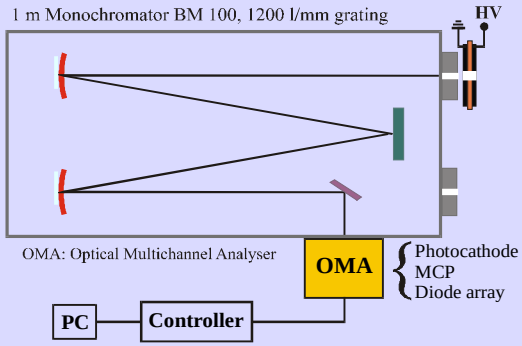
Micro-Structure Electrodes

- electrodes thickness: 40 - 100 µm
- insulator layer: 50 µm
- holes diameter: 70 - 300 µm

investigated:
- Ar at 50 - 500 mbar
- discharge current of 0.5 mA/hole

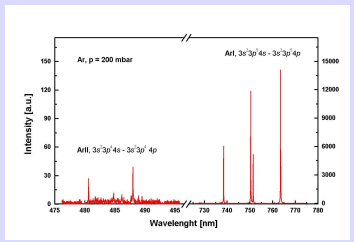
dc glow discharge

Emission spectroscopy



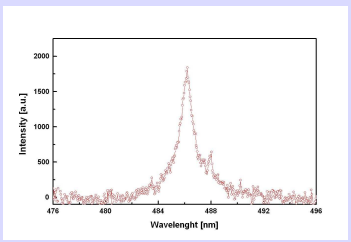
- spectral range from 350 to 850 nm
- end-on at anode/cathode side

- mainly the gas spectrum
- atomic transitions dominant (intensity ratio ArI/ArII ~ 10^4)
- excited levels with energies ≤ 21 eV



- Te ~ 1eV estimated from the relative intensities ArI/ArII (Bolzmann plot)

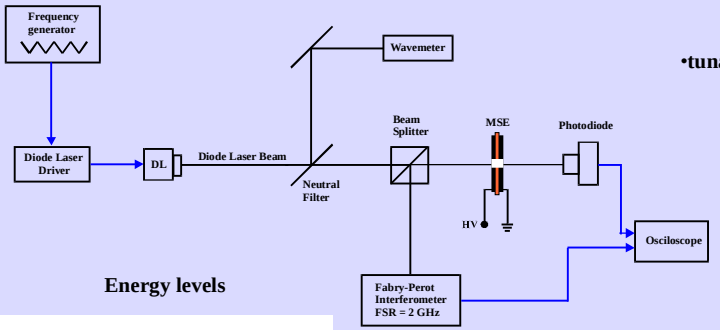
Stark Broadening of Balmer H_β



$N_e(cm^{-3}) = 1.03\times10^{16}\,\Delta\lambda_S^{\,1.488}$ Fleurier [1988]

- electron number density Ne ~ 9.5 x 10 ^{14} cm^{-3}

Absorbtion spectroscopy



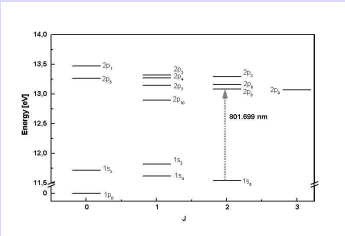
- **tunable laser absorbtion technique**

Beer-Lambert´s law

$$I_\nu = I_0 \exp(-k_\nu L)$$

$$N_{1s_5} = \frac{\frac{1}{L}A_{profile}}{\lambda_0^{\,2}\frac{g_{2p_8}}{8\pi g_{1s_5}}} A_{2p_8\to 1s_5}$$

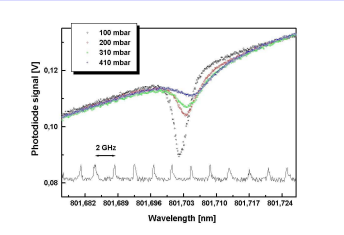
Energy levels



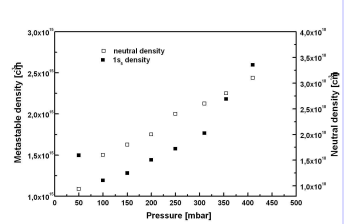
$g_{2p_8} = g_{1s_5} = 5$

$A = 9.55\times10^6 s^{-1}$

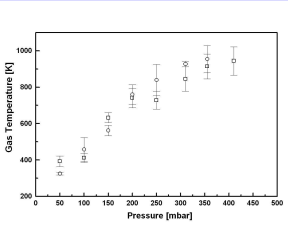
Absorption profiles



Metastable density

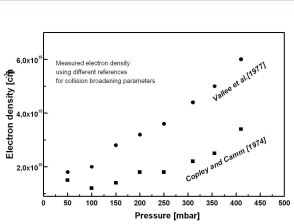


Gas temperature



- Tg strongly increases with the gas pressure

Electron number density



- Ne = 1.5-5 x 10^{15}cm
- degree of ionization of 10^{-3}

- laser atom absorption technique successfully implemented in spite of the very short absorption length

envisaged:
- investigation of different metastable/resonant levels
- decay

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