

DETERMINATION OF THE GAS TEMPERATURE OF AN ARGON MICROWAVE PLASMA AT ATMOSPHERIC PRESSURE USING VAN DER WAALS BROADENING

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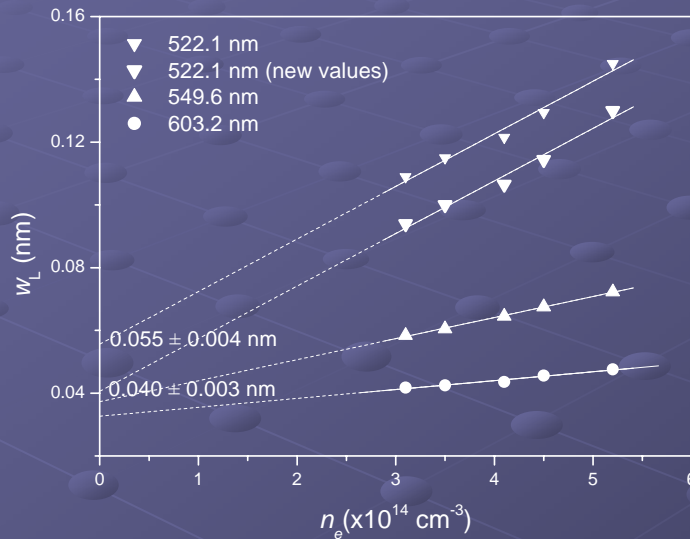
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- In order to analyze the possibility to use the van der Waals broadening of the neutral-argon lines to determine the gas temperature in an argon surface-wave sustained discharge (SWD) at atmospheric pressure, the values of the gas temperature obtained from the atomic lines with that ones obtained from the analysis of the OH molecular specie spectrum, were compared. The plasma column was created in a quartz tube with one of its ends opened to the air.

- Lorentzian broadening = Stark + van der Waals
- In an argon surface-wave plasma at atmospheric pressure the axial profile of T_g can be considered constant and so, the van der Waals broadening too.
- If the Lorentzian broadening of a spectral line depends on axial position, this line is sensitive to the electron density variation. .

Fig. The Lorentzian widths of the 522.1 (new values), 549.6 and 603.2 nm lines versus the electron density values along the plasma column



For these spectral lines a linear fit is obtained, which intersects the ordinate at a point corresponding to the Lorentzian width for zero electron density. This value is called here an origin ordinate and is determined for each analyzed line. It can be considered approximately equal to the van der Waals width and is used here to calculate the plasma gas temperature.

z (cm)	T_g (K)
4	1390 ± 105
6	1490 ± 110
8	1330 ± 110
10	1300 ± 120
12	1520 ± 110

Table. Values of the gas temperature along the plasma column obtained from the rho-vibrational spectra of the OH species.

Ar I lines	Origin ordinate (nm)	T_g (K)
603.2 nm	0.032 ± 0.002	1070 ± 110
549.6 nm	0.037 ± 0.002	1100 ± 100
522.1 nm	0.055 ± 0.004	800 ± 100 (with asymmetry)
	0.040 ± 0.003 (new value)	1260 ± 150 (without asymmetry)

Table. Values of the T_g from the origin ordinate (van der Waals broadening) obtained from the dependence of the Lorentzian width of the spectral lines on electron density. For the 522.1 nm line values with and without asymmetry are shown.

- Results are published in
- C. Yubero, M.S. Dimitrijević, M.C. Garcia, M.D. Calzada
- *Spectrochimica Acta B*, 62, 169, 2007.



Thank you