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Program and Abstracts

Poster paper

VOIGT DAMPING PARAMETER OF THE SPECTRAL LINES EMITTED BY A PLASMA FLAME AND A PLASMA COLUMN GENERATED BY MICROWAVE AT ATMOSPHERIC PRESSURE

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Atomic emission spectroscopy (AES) is a non-disruptive method to perform plasma physics diagnosis, by collecting and analyzing the radiation, registered as spectral lines, emitted by the plasma. The spectral line parameters (intensity, width) allow the values of the plasma species temperatures and populations to be determined, and in this way obtaining information about the thermodynamic equilibrium state of the discharge.

Under high pressure conditions, line profiles are adequately fitted by a Voigt function, which is the convolution of a Gaussian and a Lorentzian function. One of the parameter which characterizes this spectral lines is the *damping* or *Voigt-a* parameter, which is equal to $\Delta\lambda_L\sqrt{\ln(2)}/\Delta\lambda_D$, being $\Delta\lambda_L$ the Lorentzian broadening of the spectral line (Stark and van der Waals) and $\Delta\lambda_D$ the Gaussian broadening (Doppler effect). Its value, an indication of the relative importance of each components, supply information regarding the quantity of the local collision interactions which take place in the plasma compared to the other processes, and which must be taken into account when doing a complete description of the radiation source. In this study a simple method to experimentally obtain the *Voigt-a* parameter value of the spectral lines emitted by two kind of SWDs, a column and a flame, is presented. The Lorentzian contribution has been obtained by deconvolution of the spectral profiles and the Doppler width from the temperature of the gas; this temperature was measured using the rotation-vibration spectrums of the OH specie, which is present as impurity in the discharge.

The a-parameter values found are within interval values registered in the literature. It has observed that the modification of the discharge parameters affects the a-parameter value, which indicates that the state of the plasma and its inhomogeneity significantly influences the shape of the spectral lines and therefore also influence their parameter values. In addition, the variation shown is not the same for all the spectral lines, but it depends on the level they come from. For example, for the spectral lines involving high-lying levels the a-parameter is more sensitive to the changes of the electron density than for the lines from the internal levels. It has been observed that the a-parameter value is higher for the lines emitted from the plasma flame than from the plasma column. This is a reflection of the increase of the electronic temperature and density, and therefore of the collision and excitation capacity of the flame in relation to the column.