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SPECTROSCOPY METHODS APPLIED TO THE RESEARCH IN PLASMAS AT ATMOSPHERIC PRESSURE

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Abstract. Plasmas operated at atmospheric pressure are being the object of an increased attention due to their potential and current use in various applications such as excitation source for elemental analysis, purification of noble gases and more recently hydrogen production and sterilization of medical instruments.

In order to ensure that the technological applications of plasmas are carried out with a maximum of efficiency it is necessary to know the ability of the discharge to induce the desired microscopic processes. This ability depends on the densities of different plasma species such as electron density and both atoms and molecules at excited levels together with the energy available in the discharge. This energy is fundamentally in form of the kinetic energy of electrons (electron temperature) and heavy particles like atoms and ions (gas temperature).

Passive spectroscopy techniques can be used to measure the densities and temperatures in plasma. Moreover, these techniques also allow us to know and control the processes that take place in the plasmas during their applications in specific fields. These techniques are based on the analysis of the radiation emitted by the own plasma. So, the use of passive spectroscopy does not perturb the internal kinetics of the discharge when the observation and control of plasma application are being carried out. Therefore, an important part of the effort in experimental and theoretical research in plasmas is devoted for devising, developing and proving spectroscopy methods for the purpose mentioned above.

New methods have been recently developed in order to measure the electron density (see e.g. Yubero et al. 2005, Yubero et al. 2006) and gas temperature (see e.g. Yubero et al. 2007) of plasmas at atmospheric pressure which can be considered as a complement to the classical methods (see e.g. Calzada et al. 1996, Luque et al. 2003). An example of the use of the spectroscopy to know the processes that take place in plasmas corresponds to the study of the capacity of a surface wave discharge to dissociate the alcohols molecules for obtaining hydrogen (see e.g. Jiménez at al. 2008).

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