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Program and Abstracts

Invited lecture

SPECTROSCOPY OF THE DISCHARGES CREATED AND MAINTAINED BY A SURFACE-WAVE

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The discharges created and maintained by a surface-wave (SWD) are of a special type of microwave discharge, characterized by having dimensions higher than the wavelength of the electromagnetic field that is maintaining them, and the coupler device of the microwave energy. From an experimental point of view, the surface wave discharge has several characteristics that make it especially useful in the research of basic plasma physics, and can also be applied in different fields of science and technology. These characteristics are a) the wide range of pressure (mTorr-some atmospheres) and frequency (MHz-GHz), b)the use of different atomic (Ar, He, Kr, Xe) and molecular (N_2 and O_2) gases and their mixtures, with flows lower than 0.5 l/min against several l/min that another plasma type such as the ICP ($\sim$ 10l/min), c) the discharge extension outside the exciter device and, in this way, long plasma columns, and d) also, to point out, the absence of the significant fluctuations and instabilities and a very good reproducibility.

In recent years, SWDs are used in an increasing number of applications, such as surface treatment (formation and deposition of thin material films in the manufacturing of, for example, electronic devices), light sources, emission of laser radiation, sterilization and spectrochemical analyses. Knowing the processes (internal kinetics) which take place in the plasmas is essential if we want correctly to carry out these applications. The processes in the plasma depend on the parameter values of the plasma such as temperatures and densities. For measuring these parameters, we can use techniques of passive spectroscopy, because the wide range and intensity of the spectral lines emitted by the atoms and ions into the discharge. Starting from intensities, broadenings and shifts of the spectral lines we obtain information about the basic parameters of the plasma, such as electron density (n_e) and temperature (T_e), gas temperature (T_g) and the densities of excited atoms ($n(p)$) of the discharge such as the metastable atoms.