Diagnostic of an Organic Vapour from the Admittance Characteristics of a Spherical Probe

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The knowledge of the plasma parameters (plasma frequency fp, Debye length λ_o) is very important in plasma chemistry, as an example, in polymerisation of xylene.

The measurement of the admittance characteristics of a spherical probe is a priori the only tool when local measures are needed and the gas is a pollute (Physics Letters 1974, 504, 2, 113).

A good agreement exists in the litterature between theoretical and experimental characteristics normalized with respect to the plasma parameters deduced from a Langmuir probe. Nevertheless the greatest care must be taken in the determination of these parameters from the spherical probe admittance (inverse problem) mainly for the Debye length, because the theory depends upon the boundary conditions.

A systematic study with different gases (Helium, hydrogen, argon, xenon) has shown:

- fp is given by $fp \sim f_2/0.9$

where f_2 is the maximum of the real part of the impedance

- the better determination of λ_o is from the imaginary part of the admittance for small values of f/fp.

Now we are using such a method in a xylene plasma.

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