Plasma Consult

Langmuir Probe System L2P

Fig. 1: L2P

Characterization of a microwave plasma by in situ diagnostics

Fourth International Conference on Plasma Surface Engineering
September 1995

The work described below was performed using a JE PlasmaConsult Langmuir Probe System L2P.

A. Brockhaus, D. Korzec, F. Werner, Y. Yuan and J. Engemann

Characterization of a microwave plasma by in situ diagnostics

Forschungszentrum für Mikrostrukturtechnik, Bergische Universität-Gesamthochschule Wuppertal, Germany

Abstract

An efficient microwave plasma source has been developed in our institute. Essentially, the microwave power is coupled to the plasma by slot antennae (SLAN) which are positioned on the inner side of an annular waveguide. The source has been operated with a wide variety of different working conditions and process gases, but this study focuses on argon and nitrogen. Microwave powers of up to 2 kW have been applied and the pressure varied between 1 and 1000 Pa. The plasma parameters have been determined either in the chamber itself or in a downstream zone. We report on spatially resolved single and double Langmuir probe measurements using a computer-driven fast acquisition system. In the plasma chamber, ion densities in excess of 10^{12} cm^{-3} could be achieved. The electron temperature generally remains between 1 and 3 eV. Two different plasma regimes have been identified when the pressure is increased. Optical emission spectroscopic measurements using the Argon I line at 811.5 nm are discussed and the results compared with the electrical measurements. For a nitrogen plasma, molecular band spectra are obtained which were only partly resolved. With the choice of suitable spectral ranges, vibrational temperatures of some nitrogen states were determined, resulting in T_{vib} = 7100 K. As a complementary diagnostic method, we have used laser-induced fluorescence. From a rotational band analysis of the (0,0) band of the first negative system ($B^2\Sigma_u^+ \rightarrow X^2\Sigma_g^+$) of the nitrogen ion N_2^+, a rotational temperature of T_{rot} = 770 K has been determined.

Surface and Coatings Technology
Volumes 74-75, Part 1, September 1995, Pages 431-442

APPLICATION NOTE

L2P

APPLICATION NOTE

L2P

Plasma Consult

For further information please contact:

Plasma Consult

JE PlasmaConsult GmbH
Rainer-Gruenter-Str. 21, Geb. FN
42119 Wuppertal
Germany

Tel. ++49-202-28397-0
Fax ++49-202-28397-123
contact@plasmaconsult.de
www.plasmaconsult.com