Plasma Consult

PRODUCT INFORMATION

13.56 MHz Inductively Coupled Plasma Source ICP-P 200

Features

- planar coil with 200 mm diameter
- extended power range
- low ion energy with narrow energy spread
- high plasma and radical densities
- compatible with chemically reactive and non reactive gases
- cw and pulsed operation
- low contamination
- for more details see technical note

Applications

- plasma enhanced chemical vapor deposition (PE-CVD)
- surface modification
- plasma cleaning
- plasma etching
- reactive and non reactive ion etching
- material science (in general)

ICP-P 200

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General

Plasma-based materials processing including applications in semiconductor and micro system technology often require high densities (> 10^{11} cm^{-3}) of electrically charged (ions, electrons) and uncharged particles such as excited species and radicals. Additionally, a good plasma uniformity over larger diameters (≥ 200 mm) is required. In certain applications one is also interested in low ion energies (< 20 eV) in order to avoid substrate damage.

A promising and relatively simple method to produce such plasmas is an inductively coupled plasma (ICP) consisting of a planar, multi-turn spiral coil antenna, coupling an rf (13.56 MHz) field through a dielectric window (quartz) into the plasma chamber. However, the up-scaling of a conventional ICP source using one multi-turn spiral coil has limitations due to the increase of the inductance with antenna diameter. The large inductance causes a large voltage drop between the ends of the antenna and unstable impedance matching. Additionally, the large voltage increases the capacitive coupling of the antenna to the plasma causing a low-efficiency non-uniform plasma production.

The antenna coil system of the ICP-P 200 is designed to overcome the large induction problem. Firstly, a novel four-antenna, low inductance (0.54 µH) spiral coil is used that allows operation at lower rf voltage, since the coils are electrically parallel to each other. Secondly, the antenna housing that consist of a stainless steel cylinder and a quartz window is equipped with an eddy current shielding, thus reducing the resistive losses of the system. A uniform plasma at high density is produced without relying upon external magnetic coils.

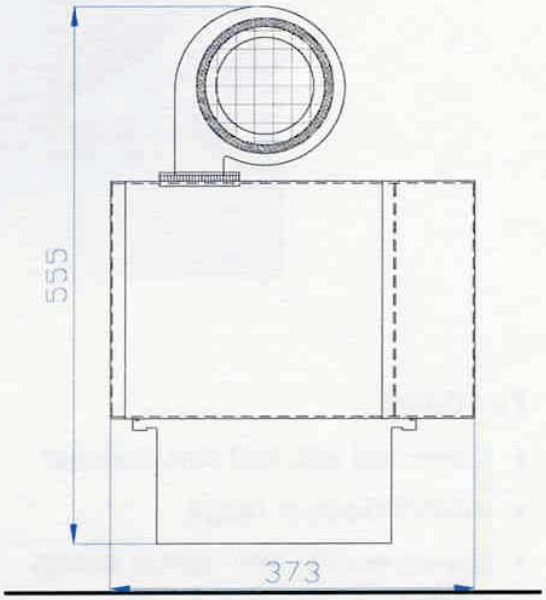
Time-modulated power coupling, which can be extremely beneficial to a variety of plasma-induced etching and deposition processes, can be performed with the ICP P 200 as well. Because of the low antenna impedance, the capacitive coupling between antenna and plasma is reduced and the transition between the dim capacitive discharge mode (so called "E mode") and the bright inductive mode (so called "H mode") occurs already at very low coil input powers even without a Faraday shield.

Fig. 1. Four-antenna coil

Technical Data

• *rf-power range*	3 - 1200 W (cw), with pulsed power operation higher peak powers possible
• *frequency*	13.56 MHz
• *pressure range*	0.25 - 100 Pa
• *cooling*	air and water (coil)
• *mounting flanges*	DN 250 ISO-KF or larger
• *gas flow rates*	*may vary with the specific plasma processes*
	examples are:
	argon: 1 – 50 sccm
	oxygen: 1 – 20 sccm

Dimensions



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