"Method and apparatus to produce large inductive plasma for plasma processing" and "Uniform Gas Distribution in Large Area Plasma Source"

Description

The present invention consists in two innovations and relates to surface treatment using plasma assisted processing and more particularly to the treatment of large flat substrates. Conventional plasma sources all present problems of gas uniformity in the centre of the plasma chamber increasing with the dimension of the chamber. Other drawbacks are: perturbation of the magnetic fields by the metallic gas distribution means; capacitive coupling detrimental to the substrate treated.
The first innovation provides a system for generating uniform planar plasma for treatment of substrates in a wide pressure and frequency range. This plasma system allows the generation of plasma on a large planar area and guarantees uniform plasma independently of the operation pressure.
The second innovation is an apparatus for generating a time-varying magnetic field in a plasma processing chamber comprising a magnetic core with a unipolar pole face structure, an inductor associated with the magnetic core, means for injecting gas through the magnetic core. The main advantage of such an arrangement is a uniform gas distribution in the plasma chamber. Moreover, the magnetic core acts as an electrostatic screen between injectors and inductor, hence eliminating the risk of capacitive coupling. Furthermore, the number of injections pipes can be adapted without perturbation of the magnetic field and eddy current generation is avoided through the presence of an electrical discontinuity. Contamination of the field emission surface by the plasma is avoided with the insertion of a barrier between the inner space of the chamber and the unipolar face structure.

Innovative aspects and main advantages

- Uniform gas distribution in the plasma chamber
- No capacitive coupling between gas injectors and inductor
- No damage to the treated work piece or substrate
- Number of gas injector pipes adaptable without magnetic field perturbations
- No connection between injector and magnetic core
- High plasma uniformity (Unitary construction for the unipolar structure)
- No eddy currents generation
- No contamination of field emission surface

Areas of application

- Reactive ion etching
- Cleaning and activation of large surfaces
- Chemical Vapour deposition
- Glass industry, large flat panel displays
- Solar cells production

Stages of development

Patent Priority date
Patent granted
Patent Pending
Technology is mature and licensed. Non-exclusive license are available.

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