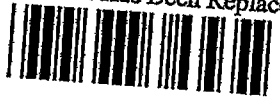
INDUCTIVELY COUPLED PLASMA REACTOR WITH SYMMETRICAL PARALLEL MULTIPLE COILS HAVING A COMMON RF TERMINAL

ABSTRACT OF THE DISCLOSURE

The invention is embodied in a coil antenna for radiating RF power supplied by an RF source into a vacuum chamber of an inductively coupled plasma reactor which processes a semiconductor wafer in the vacuum chamber, the reactor having a gas supply inlet for supplying processing gases into the vacuum chamber, the coil antenna including plural concentric spiral conductive windings, each of the windings having an interior end near an apex of a spiral of the winding and an outer end at a periphery of the spiral of the winding, and a common terminal connected to the interior ends of the plural concentric spiral windings, the RF power source being connected across the terminal and the outer end of each one of the windings. In one embodiment, the inner ends of the concentric spiral windings are connected radially outwardly to a common conductor rather than inwardly to an apex terminal. In another embodiment, the concentric spiral windings are each powered at a point intermediate the radially inner and outer ends. In yet another embodiment, there are plural radially separate groups of concentric spiral windings, each connected to a separately controlled RF power source to enable adjustment of radial distribution of the plasma ion density. In a further embodiment, the spiral concentric windings are not conformal with the shape of the chamber ceiling, and can extend above the ceiling.

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