

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 May 2003 (01.05.2003)

PCT

(10) International Publication Number
WO 03/036680 A1

(51) International Patent Classification⁷: **H01J 37/32**

(21) International Application Number: PCT/US02/30399

(22) International Filing Date:
24 September 2002 (24.09.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/007,367 22 October 2001 (22.10.2001) US

(71) Applicant: **APPLIED MATERIALS, INC.** [US/US];
P.O. Box 450A, Santa Clara, CA 95052 (US).

(72) Inventors: **HOFFMAN, Daniel, J.**; 12343 Arroyo de Arguello, Saratoga, CA 94070 (US). **YE, Yan**; 13271 Via Arriba Drive, Saratoga, CA 95008 (US). **KATZ, Dan**; 5520 Ember Court, Agoura Hills, CA 91301 (US). **BUCHBERGER, Douglas, A., Jr.**; 2076 Vintage Lane, Livermore, CA 95540 (US). **ZHAO, Xiaoye**; 117 Whit's Road, Mountain View, CA 94040 (US). **CHIANG,**

Kang-Lie; 1788 Rosswood Drive, San Jose, CA 95124 (US). **HAGEN, Robert, B.**; 6826 Cabernet Avenue, Newark, CA 94560 (US). **MILLER, Matthew, L.**; 35457 Orleans Drive, Newark, CA 94560 (US).

(74) Agents: **BERNADICOU, Michael, A.** et al.; Blakely, Sokoloff, Taylor & Zafman LLP, 7th floor, 12400 Wilshire Boulevard, Los Angeles, CA 90025 (US).

(81) Designated States (*national*): CN, JP, KR, SG.

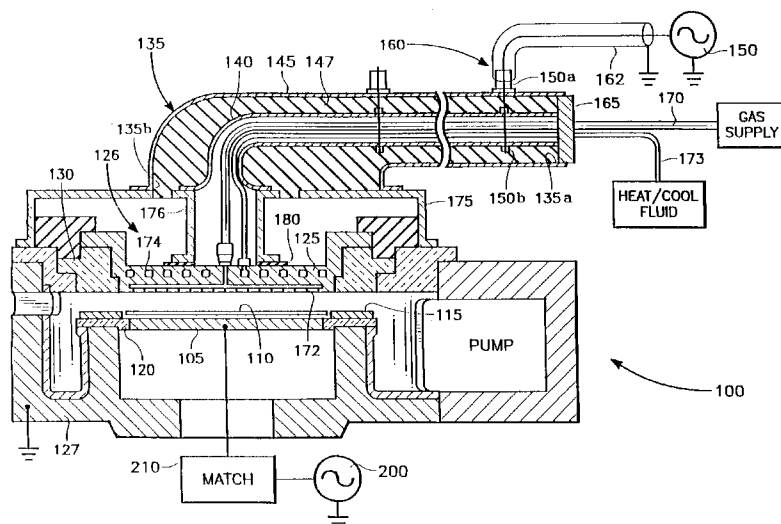
(84) Designated States (*regional*): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MERIE PLASMA REACTOR WITH SHOWERHEAD RF ELECTRODE TUNED TO THE PLASMA WITH ARCING SUPPRESSION



(57) Abstract: A plasma reactor for processing a semiconductor workpiece, includes a reactor chamber having a chamber wall and containing a workpiece support for holding the semiconductor support, the electrode comprising a portion of the chamber wall, an RF power generator for supplying power at a frequency of the generator to the overhead electrode and capable of maintaining a plasma within the chamber at a desired plasma ion density level. The overhead electrode and the plasma formed in the chamber at the desired plasma ion density resonate together at an electrode-plasma resonant frequency, the frequency of the generator being at least near the electrode-plasma resonant frequency. The reactor further includes a set of MERIE magnets surrounding the plasma process area overlying the wafer surface that produce a slowly circulating magnetic field which stirs the plasma to improve circulating magnetic field which stirs the plasma to improve plasma on density distribution uniformity.



WO 03/036680 A1