(200407357 3)

10 DEC. 2004

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

162162

(43) International Publication Date
24 December 2003 (24.12.2003)

PCT

(10) International Publication Number
WO 2003/107410 A3

(51) International Patent Classification[7]: H01L 21/311

(21) International Application Number:
PCT/US2003/018791

(22) International Filing Date: 13 June 2003 (13.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/170,424 14 June 2002 (14.06.2002) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 10/170,424 (CON)
Filed on 14 June 2002 (14.06.2002)

(71) Applicant *(for all designated States except US)*: **LAM RESEARCH CORPORATION** [US/US]; 4650 Cushing Parkway, Fremont, CA 94538 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **EPPLER, Aaron** [US/US]; 40640 High Street, Apt. 605, Fremont, CA 94538 (US). **SRINIVASAN, Mukund** [IN/US]; 3836 Springfield Common, Fremont, CA 94555 (US). **CHEBI, Robert** [US/US]; 4051 Tamayo Street, Fremont, CA 94536 (US).

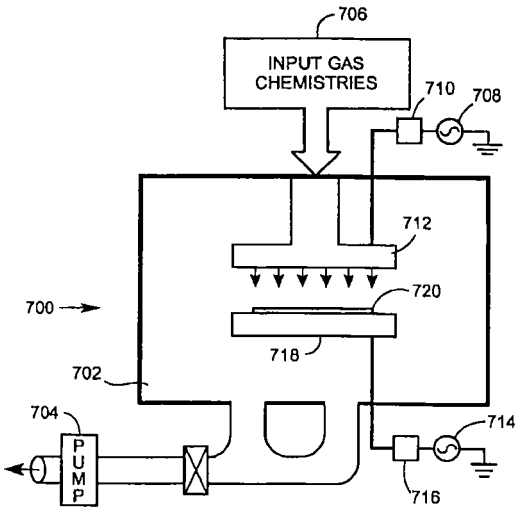
(74) Agent: **PETERSON, James, W.**; P.O. Box 1404, Alexandria, VA 22313-1404 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PROCESS FOR ETCHING DIELECTRIC FILMS WITH IMPROVED RESIST AND/OR ETCH PROFILE CHARACTERISTICS



(57) Abstract: A process of etching openings in a dielectric layer includes supporting a semiconductor substrate in a plasma etch reactor, the substrate having a dielectric layer and a patterned photoresist and/or hardmask layer above the dielectric layer; supplying to the plasma etch reactor an etchant gas comprising (a) a fluorocarbon gas (CxFyHz, where x 1, y 1, and z 0), (b) a silane-containing gas, hydrogen or a hydrocarbon gas (CxHy, where x 1 and y 4), (c) an optional oxygen-containing gas, and (d) an optional inert gas, wherein the flow rate ratio of the silane-containing gas to fluorocarbon gas is less than or equal to 0.1, or the flow rate ratio of the hydrogen or hydrocarbon gas to fluorocarbon gas is less than or equal to 0.5; energizing the etchant gas into a plasma; and plasma etching openings in the dielectric layer with enhanced photoresist/hardmask to dielectric layer selectivity and/or minimal photoresist distortion or striation.

WO 2003/107410 A3

ACTION

Published:
— *with international search report*

(88) Date of publication of the international search report:
15 April 2004

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.