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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 July 2003 (31.07.2003)

PCT

(10) International Publication Number
WO 03/063225 A2

(51) International Patent Classification[7]: H01L 21/316

(21) International Application Number: PCT/US02/01628

(22) International Filing Date: 18 January 2002 (18.01.2002)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **HONEYWELL INTERNATIONAL INC.** [US/US]; 101 Columbia Avenue, P.O. Box 2245, Morristown, NJ 07960 (US).

(72) Inventors: **LEUNG, Roger**; 1351 Rimrock Drive, San Jose, CA 95120 (US). **HACKER, Nigel**; 991 Lincoln Avenue, Palo Alto, CA 94201 (US). **XIE, Songyuan**; 7326 Carter Avenue, Newark, CA 94560 (US). **DENG, Yanpei**; 33288 Jamie Circle, Fremont, CA 94555 (US). **ENDISCH, Denis**; 7598 Orange Blossom Drive, Cupertino, CA 95014 (US).

(74) Agents: **CRISS, H., Roger** et al.; Honeywell International Inc., 101 Columbia Avenue, P.O. Box 2245, Morristown, NJ 07960 (US).

(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, 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, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

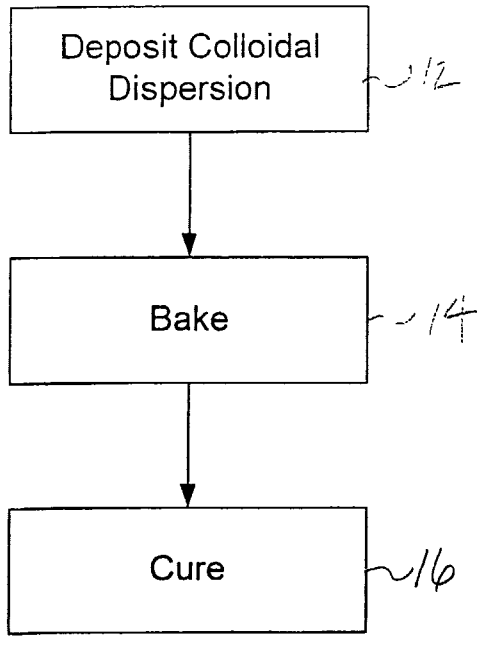
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,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

Published:

— *without international search report and to be republished upon receipt of that report*

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: DIELECTRIC FILMS FOR NARROW GAP-FILL APPLICATIONS



(57) Abstract: A colloidal suspension of nanoparticles composed of a dense material dispersed in a solent is used in forming a gap-filling dielectric material with low thermal shrinkage. The dielectric material is particularly useful for pre-metal dielectric and shallow trench isolaiton applications. According to the mehtods of forming a dielectric material, the colloidal suspension is deposited on a substrate and dried to form a porous intermediate layer. The intermediate layer is modified bz infiltration with a liquid phase matrix material, such as a spin-on polymer, followed by curing, by infiltration with a gas phase matrix material, followd by curing, or by curing alone, to provide a gap-filling, thermally stable, etch resistant dielectric material.

WO 03/063225 A2