

(51) International Patent Classification:  
*H01L 21/205* (2006.01)(21) International Application Number:  
PCT/US2015/044484(22) International Filing Date:  
10 August 2015 (10.08.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
62/047,417 8 September 2014 (08.09.2014) US  
62/128,731 5 March 2015 (05.03.2015) US(71) Applicant: **APPLIED MATERIALS, INC.** [US/US];  
3050 Bowers Avenue, Santa Clara, California 95054 (US).(72) Inventors: **BRILLHART, Paul**; 5017 Golden Road,  
Pleasanton, California 94566 (US). **CHANG, Anzhong**;  
5851 Killarney Circle, San Jose, California 95138 (US).  
**TONG, Edric**; 955 Larkspur Avenue, Sunnyvale, California  
94086-8635 (US). **LO, Kin Pong**; 3341 Hogarth Pl.,  
Fremont, California 94555 (US). **CARLSON, David K.**;  
4054 Claitor Way, San Jose, California 95132 (US).  
**SANCHEZ, Errol Antonio C.**; 324 Jill Drive, Tracy, California  
95377 (US). **YE, Zhiyuan**; 1267 Water Lily Way,  
San Jose, California 95129 (US). **KUPPURAO, Satheesh**;  
4578 Piper Dr., San Jose, California 95129 (US).(74) Agents: **PATTERSON, B. Todd** et al.; Patterson &  
Sheridan, L.L.P., 24 Greenway Plaza, Suite 1600, Houston,  
Texas 77046 (US).(81) Designated States (*unless otherwise indicated, for every  
kind of national protection available*): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,  
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,  
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,  
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,  
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,  
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,  
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,  
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (*unless otherwise indicated, for every  
kind of regional protection available*): ARIPO (BW, GH,  
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,  
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,  
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,  
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LI, LU,  
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,  
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: HONEYCOMB MULTI-ZONE GAS DISTRIBUTION PLATE

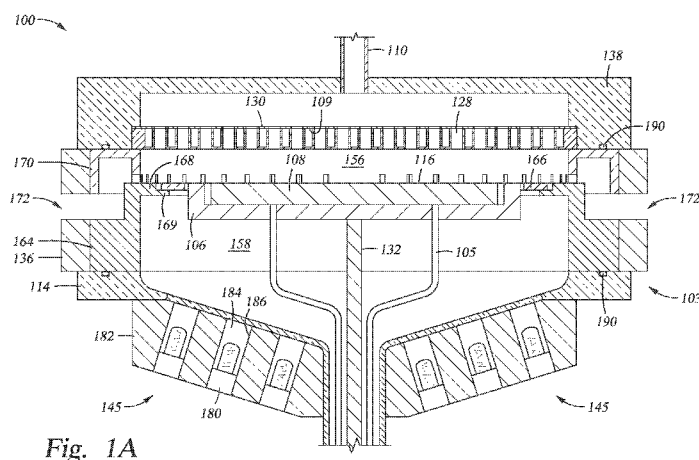


Fig. 1A

(57) Abstract: Embodiments provided herein generally relate to an apparatus for gas delivering in a semiconductor process chamber. The apparatus may be a gas distribution plate that has a plurality of through holes and a plurality of blind holes formed therein. Process gases are provided into a processing volume of the semiconductor process chamber through the through holes of the gas distribution plate. The blind holes are utilized to control the temperature of the gas distribution plate using a phase change material.