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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 June 2011 (03.06.2011)

PCT

(10) International Publication Number
WO 2011/066370 A2

(51) International Patent Classification:
H01L 31/042 (2006.01) *H01L 31/18* (2006.01)
H01L 21/20 (2006.01)

(21) International Application Number:
PCT/US2010/057980

(22) International Filing Date:
24 November 2010 (24.11.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/263,899 24 November 2009 (24.11.2009) US

(71) Applicant *(for all designated States except US)*: **AQT SOLAR, INC.** [US/US]; 1145 Sonora Court, Sunnyvale, CA 94086 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **GIRT, Erol** [CA/CA]; 6555 Stanley Street, Burnaby, British Columbia, V5E 1T7 (CA). **MUNTEANU, Mariana** [US/US]; 653 Los Olivos Drive, Santa Clara, CA 95050 (US).

(74) Agent: **SPOLYAR, Mark, James**; Baker Botts, LLP, 2001 Ross Avenue, Suite 600, Dallas, TX 75201 (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, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, 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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, 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, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2011/066370 A2

(54) **Title**: CHALCOGENIDE ABSORBER LAYERS FOR PHOTOVOLTAIC APPLICATIONS AND METHODS OF MANUFACTURING THE SAME

(57) **Abstract**: In one example embodiment, a method includes depositing one or more thin-film layers onto a substrate. More particularly, at least one of the thin-film layers comprises at least one electropositive material and at least one of the thin-film layers comprises at least one chalcogen material suitable for forming a chalcogenide material with the electropositive material. The method further includes annealing the one or more deposited thin-film layers at an average heating rate of or exceeding 1 degree Celsius per second. The method may also include cooling the annealed one or more thin-film layers at an average cooling rate of or exceeding 0.1 degrees Celsius per second.