



- (51) **International Patent Classification:**  
*H01L 21/00* (2006.01)
- (21) **International Application Number:**  
PCT/US20 14/042408
- (22) **International Filing Date:**  
13 June 2014 (13.06.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
61/835,354 14 June 2013 (14.06.2013) US
- (71) **Applicant:** ONESUN, LLC [US/US]; 27 Gate Five Road, Sausalito, CA 94965 (US).
- (72) **Inventors:** BURKETT, Adam, J.; 110 Birch Way, San Rafael, CA 94903 (US). LARSSON, Mats, I.; 1580 Jasper Drive, Sunnyvale, CA 94087 (US). ZEIRA, Eitan, C ; 31 Mill Road, Hollis, NH 03049 (US).
- (74) **Agents:** LARGENT, Craig C. et al; Kilpatrick Townsend & Stockton LLP, Two Embarcadero Center, 8th Floor, San Francisco, California 941 11 (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, LT, 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, 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, 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, KM, ML, MR, NE, SN, TD, TG).

**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

- (88) **Date of publication of the international search report:**  
21 May 2015



WO 2014/201418 A3

(54) **Title:** MULTI-LAYER MESOPOROUS COATINGS FOR CONDUCTIVE SURFACES, AND METHODS OF PREPARING THEREOF

(57) **Abstract:** Provided herein is a method of coating a conductive surface with a multi-layer mesoporous structure, by coating a conductive surface with a first photocatalytic dispersion to form a first layer over the conductive surface, curing or partially curing the first layer at temperatures of less than 400°C to form a porous structure, and coating the porous first layer with the one or more additional photocatalytic dispersions to form one or more additional layers that can penetrate or partially penetrate the pores of the structure in the first layer. The first photocatalytic dispersion includes photocatalytic particles, polymeric binder and a dispersion medium. The one or more additional photocatalytic dispersions include photocatalytic particles and a dispersion medium.

**INTERNATIONAL SEARCH REPORT**

**International application No.  
PCT/US 14/42408**

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC (8)** - H01L 21/00 (2014.01 )

**CPC** - H01 L 31/022425; H01 G 9/2031

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - H01 L 21/00 (2014.01 )

CPC - H01L 31/022425; H01G 9/2031

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) - H01 L 21/00 (2014.01 )

CPC - H01L 31/022425; H01G 9/2031; H01G 9/2059; USPC - 438/85, 98 (see search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patent, Google Scholar

Search terms used: photocatalytic, coating, conductive surface, multilayer mesoporous structure, semiconductor oxide, indium tin oxide, fluorinated tin oxide, wide band gap n-type semiconductive particles, dispersion, binder

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2005/0150545 A1 (Choi et al.) 14 July 2005 (14.07.2005) para [0009], [0019], [0021], [0028], [0044], [0053], [0073]	1-3 ----- 17, 18
Y	US 2007/0272297 A1 (Krivoshlykov et al.) 29 November 2007 (29.11.2007), para [0002], [0045]	17, 18
A	WO 2007/1 18815 A2 (Lorenzetti et al.) 25 October 2007 (25.10.2007) pg 7 ln 24-29	1-3, 17, 18
A	US 201 1/0257298 A1 (Ishihara et al.) 20 October 201 1 (20.10.201 1) para [0129], [0136]	1-3, 17, 18

Further documents are listed in the continuation of Box C.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

03 September 2014 (03.09.2014)

Date of mailing of the international search report

**0 1 APR 2015**

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US 14/42408

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.: 4-16, 19, 20  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.