

<b>Notice of Allowability</b>	<b>Application No.</b> 18/822,880	<b>Applicant(s)</b> WANG et al.	
	<b>Examiner</b> Eduardo A Rodela	<b>Art Unit</b> 2893	<b>AIA (FITF) Status</b> Yes

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1.  This communication is responsive to 11/22/2024.  
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.
2.  An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.
3.  The allowed claim(s) is/are 1-2 and 4-17. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).
4.  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
**Certified copies:**  
a)  All      b)  Some\*      c)  None of the:  
1.  Certified copies of the priority documents have been received.  
2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3.  Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5.  CORRECTED DRAWINGS (as "replacement sheets") must be submitted.  
 including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6.  DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. <input type="checkbox"/> Notice of References Cited (PTO-892)	5. <input type="checkbox"/> Examiner's Amendment/Comment
2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance
3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. <input type="checkbox"/> Other _____.
4. <input checked="" type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date. _____.	

	/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893
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### **DETAILED ACTION**

This correspondence is in response to the communications received October 31, 2024. Claims 1, 2 and 4-17 are pending. This office action is being examined under an expedited “special” status due to Applicant’s Age, see “Petition Decision” document dated October 28, 2024 in the file wrapper.

#### ***Response to Arguments***

Support for the newly amended claim 1 limitation of, “wherein at least some of the holes are elongated along the respective light receiving surfaces”, can be found in ¶ 0249, lines 30-31, “The pillars, holes, **hole(s) in pillar** and pillar(s) in holes **can have any shape, for example a rectangular pillar within a round hole**, can have any mixture thereof to optimize enhancement...” and in Fig. 46 and the associated description in the specification.

#### ***Notice of Pre-AIA or AIA Status***

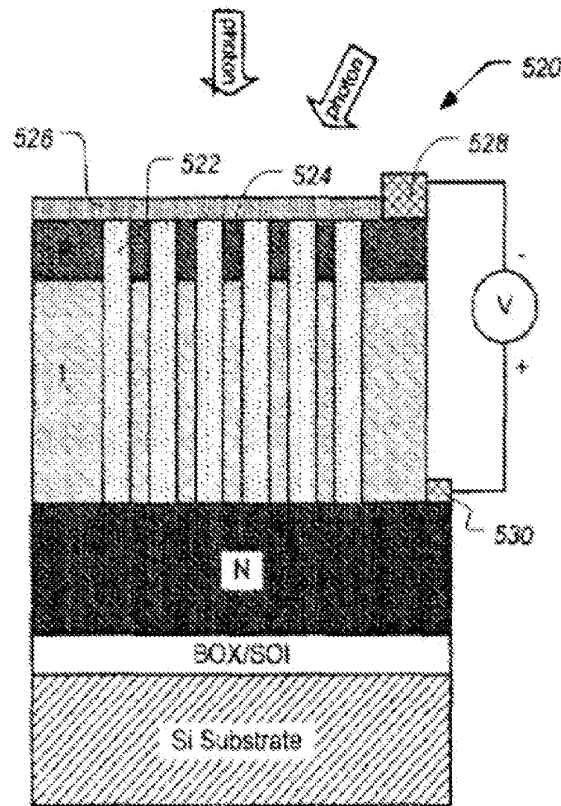
The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

#### ***Priority***

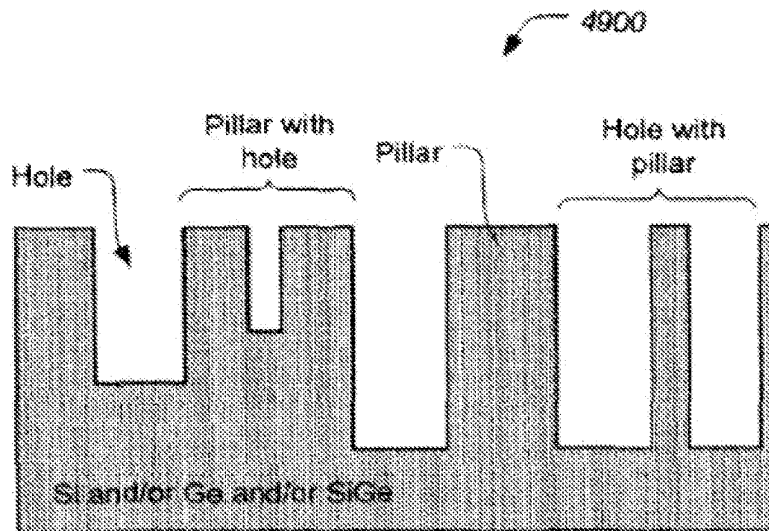
The first instance of pillars having recesses formed therein can be found in provisional application 61/834,873 (dated June 13, 2013), on pg. 39. Therefore, the instant application’s effective date is **June 13, 2013**.

*Applicant's Claim to Figure Comparison*

It is noted that this comparison is merely for the benefit of reviewers of this office action during prosecution, to allow for an understanding of the examiner's interpretation of the Applicant's independent claims as compared to disclosed embodiments in Applicant's Figures. No response or comments are necessary from Applicant.



**FIG. 5B**



**FIG. 49**

**Regarding claim 1**, the Applicant discloses in Figs. 5B and 49, an integrated structure comprising:

an array of pillars (“pillars 524”, ¶ 0132) comprising Si, Ge, and/or SiGe alloy semiconductor material, wherein at least some of the pillars are configured to include **photodetectors** and have respective light-receiving surfaces and respective sides (“The PD (and APO) photosensitive area (defined by the P-I-N or P-I-P-I-N junction area)”, ¶ 0132);

wherein at least some of the pillars comprise P-doped and N-doped regions and are configured to respond to illumination with light in selected visible and infrared wavelengths by generating electrical charge carriers (“The PD (and APO) photosensitive area (defined by the P-I-N or P-I-P-I-N junction area)”, ¶ 0132);

one or more holes that are fabricated as recesses at or under the light-receiving surface of each of at least some of the pillars, have elongated or other shapes at or parallel to the light-receiving surfaces, extend into the pillars to a depth of 100 to 10000 nm, and are filled at least partly with solid dielectric material;

wherein at least some of the holes are elongated along the respective light receiving surfaces (see Figs. 46 and 49, ¶ 0249)

side-isolation comprising solid material between at least portions of the sides of at least some of the pillars;

**a solid dielectric material** forming a base dielectric region for the array;

electrical contacts configured to provide electrical pathways coupled electrically to at least some of the **photodetectors**, including for selected reverse-biasing thereof;

wherein the presence of said one or more holes increases by a factor of at least 1.1 the absorption of the light by at least some of the **photodetectors** relative to like **photodetectors** lacking said holes.

#### REASONS FOR ALLOWANCE

Claims 1, 2 and 4-17 are allowed.

The following is an Examiner's statement of reasons for allowance: The pillar shaped photodetector device as recited in the claims of the instant invention fail to be taught by the prior art cited of interest.

**Regarding claim 1**, the prior art of Yu et al. (US 2011/0309331) discloses in Fig. 5 and Lunev et al. (US 2014/0016660) discloses in Fig. 4B, pillar shaped photodetector devices, but fails to disclose the specific characteristic recited in the claims of the instant invention e.g. the combination of claimed features of an array of pillars with particular material composition and NP junction sensitive to visible and infrared wavelengths, one or more holes that are fabricated as recesses at or under the light receiving surface of at least some of the pillars, wherein at least some of the holes are elongated along the respective light receiving surfaces, side isolation, solid dielectric forming base dielectric, electrical contacts and the presence of the holes increase absorption by a specific amount.

**Regarding claim 14**, the prior art of Yu et al. (US 2011/0309331) discloses in Figs. 4 and 5, a integrated photoconversion array, but fails to disclose the specific characteristic recited in the claims of the instant invention e.g. the combination of claimed features of an array of pillars comprising Si, Ge, and/or alloyed SiGe semiconductor material, the pillars comprise p-type and n-type doped regions for generating charge carriers, holes in the light receiving surface of at least some of the pillars, the holes are filled with solid dielectric material, side isolation, solid dielectric material forming a base dielectric region for the array, electrical contacts, the presence of holes increases absorption of light by factor of 1.1, and the array is monolithically

integrated with electronic devices for signal processing and transmission, in conjunction with the feature of,

“each of the holes has an elongated shape extending in length over less than the width of the light receiving surface in which the hole is fabricated”.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo A Rodela whose telephone number is (571)272-8797. The examiner can normally be reached M-F, 8:30-5:00pm ET.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yara B Green can be reached on (571) 270-3035. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC)

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at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/EDUARDO A RODELA/  
Primary Examiner, Art Unit 2893

Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Not for submission under 37 CFR 1.99)	Application Number	18822880
	Filing Date	2024-09-03
	First Named Inventor	Shih-Yuan WANG
	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIPDIV

U.S. PATENTS <span style="float: right;">Remove</span>						
Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	5315147		1994-05-24	Solomon	

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	1	20190001989		2019-01-17	Wang	
	2	20180102442		2018-04-12	Wang	

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	1	8905043	WO		1989-06-01	Santa Barbara Research Center		<input type="checkbox"/>
	2	2018508970	JP		2018-03-29	W&Wsens Devices Inc.		<input type="checkbox"/>

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		18822880	
	Filing Date		2024-09-03	
	First Named Inventor	Shih-Yuan WANG		
	Art Unit	2893		
	Examiner Name	EDUARDO A RODELA		
	Attorney Docket Number	309-0015USCIPDIV		

	3	02502326	JP		1990-07-26	Santa Barbara Research Center		<input type="checkbox"/>
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**NON-PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
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	1	Japanese Office Action for application number 2020-131831, dated October 7, 2024.	<input type="checkbox"/>
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If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

Examiner Signature	/EDUARDO A RODELA/	Date Considered	12/19/2024
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	18822880
	Filing Date	2024-09-03
	First Named Inventor	Shih-Yuan WANG
	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIPDIV

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ivan S. Kavrukov/	Date (YYYY-MM-DD)	2024-12-05
Name/Print	Ivan S. Kavrukov	Registration Number	25,161

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L40	36	((US-11282970-B1 OR US-9515218-B2 OR US-8384007-B2 OR US-9793439-B2 OR US-9312448-B2 OR US-9196763-B2 OR US-8835905-B2 OR US-8970751-B2 OR US-9362459-B2 OR US-7833425-B2 OR US-8592949-B2 OR US-5759292-A OR US-7276749-B2).did. AND USPT.dbnm.) OR ((US-20130125965-A1 OR US-20130112256-A1 OR US-20120313078-A1 OR US-20120298843-A1 OR US-20120196401-A1 OR US-20120153124-A1 OR US-20110315988-A1 OR US-20110309331-A1 OR US-20110297214-A1 OR US-20110272014-A1 OR US-20110253982-A1 OR US-20110226937-A1 OR US-20110180894-A1 OR US-20110133160-A1 OR US-20110057286-A1 OR US-20140016660-A1 OR US-20130026519-A1 OR US-20140070245-A1 OR US-20140174521-A1 OR US-20130330871-A1 OR US-20110281078-A1 OR US-20100116332-A1 OR US-20140125851-A1).did. AND PGPB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/17 11:12 AM
L41	36	((US-11282970-B1 OR US-9515218-B2 OR US-8384007-B2 OR US-9793439-B2 OR US-9312448-B2 OR US-9196763-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2024/12/19 02:38 PM

		US-8835905-B2 OR US-8970751-B2 OR US-9362459-B2 OR US-7833425-B2 OR US-8592949-B2 OR US-5759292-A OR US- 7276749-B2).did. AND USPT.dbnm.) OR ((US- 20130125965-A1 OR US-20130112256-A1 OR US-20120313078- A1 OR US- 20120298843-A1 OR US-20120196401-A1 OR US-20120153124- A1 OR US- 20110315988-A1 OR US-20110309331-A1 OR US-20110297214- A1 OR US- 20110272014-A1 OR US-20110253982-A1 OR US-20110226937- A1 OR US- 20110180894-A1 OR US-20110133160-A1 OR US-20110057286- A1 OR US- 20140016660-A1 OR US-20130026519-A1 OR US-20140070245- A1 OR US- 20140174521-A1 OR US-20130330871-A1 OR US-20110281078- A1 OR US- 20100116332-A1 OR US-20140125851- A1).did. AND PGPB.dbnm.)	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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L43	3	((("W&W") near3 ("SENS") near3 ("DEVICES") near3 ("INC"))).AS,AANM.	(US-PGPUB; USPAT)	OR	ON	ON	2024/12/19 03:20 PM
L44	863	((("WANG") near3 ("Shih-Yuan")) OR (("WANG") near3 ("Shih-Ping"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2024/12/19 03:20 PM
L45	84115	(H01L31/02019 OR H01L31/022408 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2024/12/19 03:20 PM

L46	2293797	H01L31/02327 OR H01L31/02363 OR H01L31/028 OR H01L31/035281 OR H01L31/105 OR H01L31/107).cpc.  (light OR infrared OR "IR") WITH (pillar OR column\$2 OR cylinder)	AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)  (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L47	30927299	(aperture\$1 OR gaps OR void OR divot)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L48	191	("20050092925" "20050 184354" "20070092192  "20070190434" "2008 0047604" "2008021874 0" "20080248608" "200 80265449" "200810125 82" "20090188557" "20 090267049" "20100029 067" "20100126548" "2 0100193768" "2010019 7068" "20100221866" "	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM

L49	101	20100313941 "20120193676 "20120292676 "20130207222 "20140001528 "20150041965 "20160225631 "4571559 "4637129 "4716449 "5451767 "5457327A "5625636 "5757057 "5886374 "6027956 "6177289 "6667528 "7115971 "7397101 "7495306 "7601597 "7674563 "7772615 "7795064 "7893348 "7898052 "7972934 "8114695 "8129710 "8436370 "8357960 "20050092925 "20050184354 "20060218740 "20070092192 "20080265449 "20090188557 "20100126548 "20100193766 "20100197068 "4637129 "5457327 "7115971 "7397101 "7501597 "7674563 "7795064 "7893346 "8129710").PN.	RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L50	1	("20070190434 "20080047604 "20080248608 "20081012582 "20090267049 "20100029067 "20100221866 "20100313941 "20120193676 "20120292676 "20130207222 "20140001528 "20150041965 "20160225631 "4571559 "4716449 "5451767 "5625636 "5757057 "5886374 "6027956 "6177289 "6667528 "7495306 "7772615 "7898052 "7972934 "8114695 "8357960 "8436370").PN.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L51	31537	H01L31/0236,02363,0352.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2024/12/19 03:20 PM

L52	95452	L5 OR L14	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
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L56	1	"20150171272").pn. AND (PGPB   USPT   USOC).dbnm. "9312448".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L57	386	(@r pd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L15 AND L7 AND L6	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L58	38	("6946682"   "7601993"   "7923753"   "8525227"   "8604511"   "8735941"   "8941146"   "8969198"   "9660043"   "20020142548"   "20070187677"   "20080173898"   "20080217625"   "20080258150"   "20090035884"   "20090127575"   "20090212276"   "20100059781"   "20110018024"   "20110143507"   "20110198641"   "20110233520"   "20110233596"   "20120049152"   "20120119189"   "20120235204"   "20120248500"   "20130026519"   "20130320352"   "20140016660"   "20140264454").pn. OR ("9793439").urpn. AND (PGPB   USPT   USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L59	36	(@r pd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L21	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L60	1	"20110309331"	(US-PGPUB)	OR	ON	ON	2024/12/19 03:20 PM
L61	1	"20140016660"	(US-PGPUB)	OR	ON	ON	2024/12/19 03:20 PM
L62	214	(texture OR recesses OR divots OR holes) WITH surface WITH	(US-PGPUB)	OR	ON	ON	2024/12/19 03:20 PM

L63	277	(diode) WITH (absorb\$3 OR absorption OR efficiency) WITH light (@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L25	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L64	1996	(textur\$3 OR texturized) WITH ("1" OR "10" OR "20" OR "30" OR "40" OR "50") NEAR (nanometer\$1 OR "nm")	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L65	245	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L27 AND L14	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L66	76	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L27 AND L14	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L67	594	(textur\$3 OR texturized) WITH surface WITH (increas\$3 NEAR (efficiency OR absorb\$3 OR absorption))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L68	78	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L30 AND L14	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L69	36	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L30 AND L14 AND (percent\$3 OR	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM

L70	0	"%") (@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L30 AND (L14 SAME (percent\$3 OR "%"))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L71	0	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L30 AND (L14 SAME (percent\$3 OR "%"))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L72	7638562	(signal NEAR process\$3) AND (output OR transmission)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
L73	244	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND L14 AND L35	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L74	4526	(@rtpd<="20130613" OR @rtad<="20130613" OR @pd<="20130613" OR @ad<="20130613") AND (cmos NEAR imager) AND L35	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
L75	747	(@rtpd<="20130613" OR	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM

L76	0	<p>@rtad&lt;="20130613"  OR @pd&lt;="20130613"  OR @ad&lt;="20130613")  AND (cmos NEAR  imager) AND ((signal  NEAR process\$3) AND  (output OR  transmission)) AND  monolithic\$4  (L2 OR L3 OR L15)  AND ((integrated NEAR  structure)(array)(pillars)  (holes)(p-doped)(n-  doped)(light NEAR  receiving NEAR  surfaces)(visible)(infrare  d)(wavelengths)(photos  ensitive NEAR  area)(charge NEAR  carriers)(holes)(recesse  s)(side NEAR  isolation)(base NEAR  dielectric)(electrical  NEAR  contacts)(factor)(increa  se)(abosorption)("1.1").  clm.</p>	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	AND	ON	ON	2024/12/19 03:20 PM
L77	36	<p>((US-11282970-B1 OR  US-9515218-B2 OR  US-8384007-B2 OR  US-9793439-B2 OR  US-9312448-B2 OR  US-9196763-B2 OR  US-8835905-B2 OR  US-8970751-B2 OR  US-9362459-B2 OR  US-7833425-B2 OR  US-8592949-B2 OR  US-5759292-A OR US-  7276749-B2).did. AND  USPT.dbnm.) OR ((US-  20130125965-A1 OR  US-20130112256-A1  OR US-20120313078-  A1 OR US-  20120298843-A1 OR  US-20120196401-A1  OR US-20120153124-  A1 OR US-  20110315988-A1 OR  US-20110309331-A1  OR US-20110297214-  A1 OR US-  20110272014-A1 OR  US-20110253982-A1  OR US-20110226937-  A1 OR US-</p>	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM

L78	36	<p>20110180894-A1 OR  US-20110133160-A1  OR US-20110057286-  A1 OR US-  20140016660-A1 OR  US-20130026519-A1  OR US-20140070245-  A1 OR US-  20140174521-A1 OR  US-20130330871-A1  OR US-20110281078-  A1 OR US-  20100116332-A1 OR  US-20140125851-  A1).did. AND  PGPB.dbnm.)</p> <p>((US-11282970-B1 OR  US-9515218-B2 OR  US-8384007-B2 OR  US-9793439-B2 OR  US-9312448-B2 OR  US-9196763-B2 OR  US-8835905-B2 OR  US-8970751-B2 OR  US-9362459-B2 OR  US-7833425-B2 OR  US-8592949-B2 OR  US-5759292-A OR US-  7276749-B2).did. AND  USPT.dbnm.) OR ((US-  20130125965-A1 OR  US-20130112256-A1  OR US-20120313078-  A1 OR US-  20120298843-A1 OR  US-20120196401-A1  OR US-20120153124-  A1 OR US-  20110315988-A1 OR  US-20110309331-A1  OR US-20110297214-  A1 OR US-  20110272014-A1 OR  US-20110253982-A1  OR US-20110226937-  A1 OR US-  20110180894-A1 OR  US-20110133160-A1  OR US-20110057286-  A1 OR US-  20140016660-A1 OR  US-20130026519-A1  OR US-20140070245-  A1 OR US-  20140174521-A1 OR  US-20130330871-A1  OR US-20110281078-</p>	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/12/19 03:20 PM
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L79	17	A1 OR US-20100116332-A1 OR US-20140125851-A1).did. AND PGPB.dbnm.) ("3620829"   "4078945"   "4227942"   "4640001"   "4675466").pn. OR ("5759292").urpn. AND (PGPB   USPT   USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/12/19 03:20 PM
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**PE2E SEARCH - Search History (Interference)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	0	(L43 OR L44 OR L52) AND ((array)(pillars)(semiconductor)(photodetectors)(light-receiving NEAR surfaces)(P-doped)(N-doped)(regions)(visible)(infrared)(wavelengths)(electrical NEAR charge NEAR carriers)(holes)(recesses)(elongated)(depth)(isolation)(solid NEAR dielectric NEAR material)(absorption)(factor)).clm.	(US-PGPUB; USPAT)	AND	ON	ON	2024/12/19 05:03 PM

Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Not for submission under 37 CFR 1.99)	Application Number	18822880
	Filing Date	2024-09-03
	First Named Inventor	Shih-Yuan WANG
	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIPDIV

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
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	1	20080083963		2008-04-10	Hsu			
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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	18822880
	Filing Date	2024-09-03
	First Named Inventor	Shih-Yuan WANG
	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIPDIV

	1		<input type="checkbox"/>
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**EXAMINER SIGNATURE**

Examiner Signature	/EDUARDO A RODELA/	Date Considered	12/19/2024
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number	18822880
	Filing Date	2024-09-03
	First Named Inventor	Shih-Yuan WANG
	Art Unit	2893
	Examiner Name	EDUARDO A RODELA
	Attorney Docket Number	309-0015USCIPDIV

**CERTIFICATION STATEMENT**

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ivan S. Kavrukov/	Date (YYYY-MM-DD)	2024-11-18
Name/Print	Ivan S. Kavrukov	Registration Number	25,161

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

<b>Notice of References Cited</b>	Application/Control No. 18/822,880	Applicant(s)/Patent Under Reexamination WANG et al.	
	Examiner Eduardo A Rodela	Art Unit 2893	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-9515218-B2	2016-12-06	Yu; Young-June	H01L31/075	1/1
*	B	US-20130125965-A1	2013-05-23	Hazeghi; Arash	H01L31/18	438/57
*	C	US-20120196401-A1	2012-08-02	Graham; William	H01L31/035227	977/840
*	D	US-9263519-B2	2016-02-16	Lal; Amit	B82Y10/00	1/1
*	E	US-20110309331-A1	2011-12-22	Yu; Young-June	H01L31/028	438/73
*	F	US-20140016660-A1	2014-01-16	Lunev; Alexander	H01L33/387	257/432
*	G	US-7276749-B2	2007-10-02	Martin; Peter	H01L31/105	257/292
*	H	US-5759292-A	1998-06-02	Arimoto; Satoshi	H01L31/022458	257/E31.13
*	I	US-20110297214-A1	2011-12-08	Kim; James C.	H01L31/184	977/762
	J					
	K					
	L					
	M					


**FOREIGN PATENT DOCUMENTS**

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\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in YYYY-MM-DD format are publication dates. Classifications may be US or foreign.

<b>Search Notes</b> 	<b>Application/Control No.</b> 18/822,880	<b>Applicant(s)/Patent Under Reexamination</b> WANG et al.
	<b>Examiner</b> Eduardo A Rodela	<b>Art Unit</b> 2893

CPC - Searched*		
Symbol	Date	Examiner
H01L31/02019; H01L31/022408; H01L31/02327; H01L31/02363; H01L31/028; H01L31/035281; H01L31/105; H01L31/107; H01L31/0236,02363,0352	11/14/2024	EAR

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

\* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E search - see history for complete details	11/14/2024	EAR
Applicant & Inventor search	11/14/2024	EAR

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Doc code: IDS

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Shih-Yuan WANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	309-0015USCIPDIV	

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Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	
	1	11309444		2022-04-19	Wang et al.		
	2	8558336		2013-10-15	Su		
	3	10411053		2019-09-10	Yokogawa		
	4	10522582		2019-12-31	Maruyama et al.		
	5	9000492		2015-04-07	Suzuki et al.		
	6	6879014		2005-04-12	Wagner		
	7	7396696		2008-07-08	Kim		
	8	7525170		2009-04-28	Hsu		

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Shih-Yuan WANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	309-0015USCIPDIV	

	9	8129710		2012-03-06	Cho	
	10	8357960		2013-01-22	Dutta	
	11	8946675		2015-02-03	Yu	
	12	9184202		2015-11-10	Dutta	
	13	11211419		2021-12-28	Wu	
	14	11728457		2023-08-15	Sung	

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**U.S.PATENT APPLICATION PUBLICATIONS**

Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100320444		2010-12-23	Dutta	
	2	20110309331		2011-12-22	Yu et al.	
	3	20180182806		2018-06-28	Jin et al.	

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	Filing Date		
	First Named Inventor	Shih-Yuan WANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	309-0015USCIPDIV	

	4	20110156195		2011-06-30	Tivarus et al.	
	5	20120153127		2012-06-21	Hirigoyen et al.	
	6	20180012918		2018-01-11	Na et al.	
	7	20190166317		2019-05-30	Tanaka et al.	
	8	20120012741		2012-01-19	Vasylyev	
	9	20180102442		2018-04-12	Wang	
	10	20160240579		2016-08-18	Sun et al.	
	11	20170141153		2017-05-18	Lee et al.	
	12	20180102442		2018-04-12	Wang et al.	
	13	20200006407		2020-01-02	Yokogawa	
	14	20200006416		2020-01-02	Baba et al.	

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	First Named Inventor	Shih-Yuan WANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	309-0015USCIPDIV	

15	20050145779		2005-07-07	Mochizuki et al.	
16	20120153416		2012-06-21	Tanaka et al.	

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**FOREIGN PATENT DOCUMENTS**

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1	20080101301	KR		2008-11-21	Dongbu Hitek Co. Ltd.		<input type="checkbox"/>
	2	2002314116	JP		2002-10-25	Seiko Epson Corp.		<input type="checkbox"/>
	3	0103255	WO		2001-01-11	Scott		<input type="checkbox"/>
	4	2019018846	WO		2019-01-24	W&W Sens Devices Inc.		<input type="checkbox"/>
	5	09040854	EP		1999-09-08	IBM United Kingdom Limited		<input type="checkbox"/>
	6	2007013065	JP		2007-01-18	Matsushita Electric Works Ltd.		<input type="checkbox"/>
	7	103956403	CN		2017-02-15	Suzhou Beipeng Photoelectric Technology Co. Ltd.		<input type="checkbox"/>

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Shih-Yuan WANG	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	309-0015USCIPDIV	

NON-PATENT LITERATURE DOCUMENTS <span style="float: right;">Remove</span>			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	Copy of International Search Report and Written Opinion for PCT/US2020/051733 mailed December 17, 2020.	<input type="checkbox"/>
	2	Copy of Written Opinion of International Search Report for PCT/US2020/051733 dated December 17, 2020.	<input type="checkbox"/>
	3	BEAUSOLEIL, Nanoelectronic and Nanophotonic Interconnect, The emerging integrated circuit interconnection bottleneck may be overcome if tiny, efficient photon-transport waveguides and small transceivers for photon-electron information exchange can be developed, 18 pages, January 29, 2007; revised September 25, 2007.	<input type="checkbox"/>
	4	Copy of International Search Report and Written Opinion for PCT/US2021/050717 mailed December 6, 2021.	<input type="checkbox"/>
	5	B. F. LEVIN et al., 1 Gb/s Si High Quantum Efficiency Monolithically Integrable, Applied Physics Letters, AIP Publishing LLC, Vol. 66, No. 22, May 29, 1995, Pages 2984-2986.	<input type="checkbox"/>
	6	GAO YANG et al., Photon-trapping Microstructures Enable High-speed High-efficiency Silicon Photodiodes, Nature Photonics, Vol. 11, No. 5, April 3, 2017, Pages 301-308.	<input type="checkbox"/>
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Examiner Signature	/EDUARDO A. RODELA/		Date Considered 11/14/2024
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
<small> <sup>1</sup> See Kind Codes of USPTO Patent Documents at <a href="http://www.USPTO.GOV">www.USPTO.GOV</a> or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.                 </small>			

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	Attorney Docket Number	309-0015USCIPDIV	

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

**OR**

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

**SIGNATURE**

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ivan S. Kavrukov/	Date (YYYY-MM-DD)	2024-09-03
Name/Print	Ivan S. Kavrukov	Registration Number	25,161

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**