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NOTICE OF ALLOWANCE AND FEE(S) DUE

23432 7590 10/08/2019
COOPER & DUNHAM, LLP
30 Rockefeller Plaza
20th Floor
NEW YORK, NY 10112

EXAMINER

RODELA, EDUARDO A

ART UNIT

PAPER NUMBER

2893

DATE MAILED: 10/08/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/042,535	07/23/2018	Shih-Yuan WANG	5176/88184-CIP-1	1069

TITLE OF INVENTION: MICROSTRUCTURE ENHANCED ABSORPTION PHOTSENSITIVE DEVICES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	01/08/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE 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.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23432 7590 10/08/2019
COOPER & DUNHAM, LLP
30 Rockefeller Plaza
20th Floor
NEW YORK, NY 10112

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/042,535	07/23/2018	Shih-Yuan WANG	5176/88184-CIP-1	1069

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APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	01/08/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
RODELA, EDUARDO A	2893	257-431000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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16/042,535	07/23/2018	Shih-Yuan WANG	5176/88184-CIP-1	1069
23432 7590 10/08/2019 COOPER & DUNHAM, LLP 30 Rockefeller Plaza 20th Floor NEW YORK, NY 10112			EXAMINER RODELA, EDUARDO A	
			ART UNIT	PAPER NUMBER
			2893	
DATE MAILED: 10/08/2019				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 minutes 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 disclosure of these records is required by the Freedom of Information Act.
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 inspection 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.

Notice of Allowability	Application No. 16/042,535	Applicant(s) WANG et al.	
	Examiner Eduardo A Rodela	Art Unit 2893	AIA (FITF) Status 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 telephone interview 10/2/2019.
☐ 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 1-24 and 46-50. 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 or send an inquiry to 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. ☒ Notice of References Cited (PTO-892)	5. ☒ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>10/2/2019</u> .	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____.	7. ☐ Other ____.
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date. <u>10/2/2019</u> .	

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

This correspondence is in response to the Applicant initiated interview communications received October 2, 2019. Claims 1-24 and 46-50 are under consideration.

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.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Ivan S. Kavrukov on October 2, 2019.

The application has been amended as follows:

Please cancel claims 25-45. Claims 25-45 were directed to a non-elected embodiment without traverse a telephone conversation on April 6, 2019.

Regarding claim 1, on line 3, please replace “semiconductor material” with “silicon and / or germanium”, and replace lines 10 and 11, with the following, “said one or more I-layers are continuous and planar except for any penetration thereof by said holes”, and finally after the last line of the claim, insert the following, “said photodetector being configured to operate in the frequency of 1-100 Giga bits per second range”.

Regarding claim 46, on line, please replace “semiconductor material” with “silicon and / or germanium”, replace lines 9 and 10, with the following, “forming said one or more I-layers are continuous and planar except for any penetration thereof by said holes”, and finally after the last line of the claim, insert the following, “said photodetector being configured to operate in the frequency of 1-100 Giga bits per second range”.

REASONS FOR ALLOWANCE

Claims 1-24 and 46-50 are allowed.

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

Regarding claims 1 and 46, the prior art of Kwark et al. (US 6,538,299) in Figures 3-6 discloses a lateral microstructure enhanced photodetector, but fails to disclose the specific characteristic recited in the claims of the instant invention e.g. the combination of features of the

laterally oriented photodetector with microstructure holes in the intrinsic layer in conjunction with the intrinsic silicon and or germanium layer with holes is also continuous and planar, and the device operates in the particularly claimed frequency range.

Fax / Telephone 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 on 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, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

Application/Control Number: 16/042,535
Art Unit: 2893

Page 5

like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/EDUARDO A RODELA/
Primary Examiner, Art Unit 2893

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Dkt. 5176/88184-CIP-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Shih-Yuan WANG et al.

Group Art Unit: 2893

Application No.: 16/042,535

Examiner: Eduardo A. RODELA

Date Filed: July 23, 2018

For: MICROSTRUCTURE ENHANCED ABSORPTION PHOTSENSITIVE DEVICES

Confirmation No.: 1069

Class-Subclass: 257-431000

Issue Fee Due Date: January 8, 2020

This correspondence is being transmitted by facsimile transmission
and/or EFS-Web to the U.S. Patent and Trademark Office.

/Maria Antonakis/ October 23, 2019

Maria Antonakis

Date

30 Rockefeller Plaza, 20th Floor
New York, New York 10112
Tel.: (212) 278-0400

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**AMENDMENT AFTER NOTICE OF ALLOWANCE
PURSUANT TO 37 C.F.R. §1.312**

Sir:

This Amendment is submitted pursuant to 37 C.F.R. §1.312 in response to the October 8,
2018 Notice of Allowance issued by the Patent Office.

Amendments to the Claims are reflected in the **Listing of Claims** section which begins
on page 2.

Remarks begin on page 9 of this paper.

Listing of Claims

The following listing of claims will replace all prior versions, and listings, of claims in the subject application:

1. (previously presented) A lateral microstructure-enhanced photodetector comprising:
one or more laterally extending, non-doped or low-doped I-layers of semiconductor material;
interdigitated electrodes that are laterally spaced from each other and are electrically coupled with said one or more I-layers and configured to produce a laterally extending electrical field therein;
a microstructure comprising a laterally extending multiplicity of deliberately formed holes in said photodetector;
wherein:
said one or more I-layers are continuous except for any penetration thereof by said holes;
said holes have heights in a direction transverse to said I-layers;
said photodetector is configured to respond to illumination with spatially continuous light at each of one or more regions each encompassing a multiplicity of said holes, in a direction transverse to said one or more I-layers, by producing an electrical output that depends on said illumination; and
said holes enhance a desirable electrical response of said photodetector to said light in one or more selected wavelength ranges compared to an electrical response of an otherwise same photodetector without said holes.
2. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a monolithic chip and one or more active electronic circuits monolithically integrated with said photodetector on or in said chip and electrically coupled with said electrodes to receive and process said electrical output.

3. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a monolithic chip and plural active electronic circuits monolithically integrated with said photodetector on or in said cup and electrically coupled with said electrodes to receive and process said electrical output.
4. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a monolithic chip and plural electronic circuits monolithically integrated with said photodetector on or in a said chip and electrically coupled with said electrodes to receive and process said electrical output, and one or more light emitting devices mounted to said chip and coupled to one or more active electronic circuits to be driven thereby.
5. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which at least some of said holes are laterally between said electrodes.
6. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said electrodes overlie at least some of said holes.
7. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a cover layer over said one of more I-layers, and wherein said holes are only in said cover layer.
8. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said holes extend only partway down from a top surface of said one of more I-layers.
9. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said one or more I-layers have a top surface and a bottom surface and said holes extend down from said top to said bottom surface.

10. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said holes comprise islands of dielectric material laterally spaced from each other by said semiconductor material of said I-layers, formed by selective area growth.
11. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said one or more I-layers have a bottom surface and at least some of said holes extend from said bottom surface up into said one or more I-layers and comprise material with electrical and/or optical properties different from those of said one or more I-layers.
12. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said one or more I-layers have a top surface and a bottom surface and some of said holes extend into said one or more I-layers down from said top surface and some of said holes extend into said one or more I-layers up from said bottom surface.
13. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said holes comprise a solid dielectric material.
14. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said holes comprise a semiconductor material that is different from the semiconductor material of said one or more I-layers.
15. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said electrodes comprise laterally extending conductors and doped semiconductor material regions thereunder, laterally spaced by said one or more I-layers and forming one or more PN junctions in said photoconductor, where the materials forming each of the one or more PN junctions are touching.

16. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further comprising at least one doped semiconductor region and in which said electrodes comprise laterally extending conductors and additional doped semiconductor material regions under one or more of said conductors and in ohmic contact therewith, said doped regions being laterally spaced by said one or more I-layers and forming one or more PN junctions in said photoconductor, where the materials forming each of the one or more PN junctions are touching.
17. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said electrodes comprise laterally extending conductors forming Schottky junctions in said photodetector.
18. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which at least two of said electrodes differ from each other in vertical position relative to a top surface of said one or more I-layers.
19. (currently amended) The lateral microstructure-enhanced photodetector of claim 1, in which at least one of said electrodes has a bottom surface that is [[at]] below a top surface of said one or more I-layers.
20. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, in which said electrodes and said one or more I-layers have at least one of (i) top surfaces that are substantially at the same level and (ii) bottom surfaces that substantially at the same level.

21. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a layer of a light-absorbing material over at least portions of said electrodes.
22. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a light-absorbing layer that is over at least portions of said electrodes and has a nano-structured top surface.
23. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a light-absorbing layer that is over at least portions of said electrodes and said one or more I-layers and has a nano-structured top surface.
24. (previously presented) The lateral microstructure-enhanced photodetector of claim 1, further including a layer of doped semiconductor over at least a portion of said one or more I-layers, forming one or more PN junctions in said photodetector, where the material forming each of the one or more PN junctions are touching.
- 25-45 (previously canceled).
46. (currently amended) A method of manufacturing a microstructure-enhanced photodetector comprising:
 - providing one or more laterally extending, non-doped or low-doped I-layers of Silicon and/or Germanium, plural electrodes electrically coupled with said one or more I-layers and configured to produce an electrical field therein, and a microstructure comprising a laterally extending multiplicity of deliberately formed holes in said photodetector;
 - said providing step further comprising:
 - forming said one or more I-layers ~~are as~~ continuous and planar layers except for any penetration thereof by said holes;
 - configuring said photodetector to respond to illumination with spatially

continuous light at each of one or more regions each encompassing a multiplicity of said holes, in a direction transverse to said one or more I-layers, by producing an electrical output that depends on said illumination;

configuring said holes to enhance a desirable electrical response of said photodetector to said light in one or more selected wavelength ranges compared to an electrical response of an otherwise same photodetector without said holes; and

monolithically integrating said photoconductor on or in a single chip with one or more active electronic circuits and electrically connecting said photodetector and said active electronic circuits for transfer of said electrical output to said circuits for processing thereby;

said photodetector being configured to operate in the frequency of 1 – 100 Giga bits per second range.

47. (previously presented) The method of claim 46, further including providing one or more additional photodetectors each comprising a laterally extending multiplicity of holes that enhance desirable electrical responses of said one or more additional photodetectors to light having selected wavelengths compared to otherwise same photodetectors without said holes and assembling said photodetectors on or in said chip and electrically connecting them with said one or more active electronic circuits.
48. (previously presented) The method of claim 46, further including providing plural additional photodetectors each comprising a laterally extending multiplicity of holes that enhance desirable electrical responses of said one or more additional photodetectors to light having selected wavelengths compared to otherwise same photodetectors without said holes and fluidically assembling said photodetectors on or in said chip and electrically connecting them with said active electronic circuits.

49. (previously presented) The method of claim 46, further including providing one or more additional photodetectors each comprising a laterally extending multiplicity of holes that enhance desirable electrical responses of said one or more additional photodetectors to light having selected wavelengths compared to otherwise same photodetectors without said holes and one or more light emitting devices and assembling said photodetectors and said light emitting devices on or in said chip, and electrically connecting said photodetectors and light emitting devices with said active electronic circuits.
50. (previously presented) The method of claim 46, comprising forming at least some of said holes as island of a solid material that differs in electrical and/or optical properties from said one or more I-layers and forming at least some of said holes involves etching or deposition and forming at least some of the material of said one or more I-layers employs epitaxial layer growth over said islands.

REMARKS

Claims 1-24 and 46-50 are allowed.

This paper presents claim 1 as edited by the Examiner's Amendment, corrects a minor typing error in claim 19, corrects a minor typing error in claim 46 as amended by the Examiner's Amendment. No issues of new matter are raised, and entry of this paper should not require excessive work on the part of the Office.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any required fees in connection with this amendment, and to credit any overpayment, to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Response to Rule 312 Communication	Application No. 16/042,535	Applicant(s) WANG et al.	
	Examiner Eduardo A Rodela	Art Unit 2893	AIA (FITF) Status Yes
<p align="center">-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --</p> <p>1. ☒ The amendment filed on <u>23 October 2019</u> under 37 CFR 1.312 has been considered, and has been:</p> <p>a) ☒ entered.</p> <p>b) ☐ entered as directed to matters of form not affecting the scope of the invention.</p> <p>c) ☐ disapproved because the amendment was filed after the payment of the issue fee. Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.</p> <p>d) ☐ disapproved. See explanation below.</p> <p>e) ☐ entered in part. See explanation below.</p> <p>_____</p>			
		/EDUARDO A RODELA/ Primary Examiner, Art Unit 2893	