October 10th, 2018

*Paper #: JoVE59026*

*Silicon-tipped fiber-optic sensing platform with high resolution and fast response*

*Authors: Guigen Liu, Qiwen Sheng, Weilin Hou, Matthew L. Reinke, Ming Han*

Dear Dr. DSouza,

We appreciate that you returned the reviewer comments and gave us the opportunity to revise our manuscript. While reviewers #2-4 provided comments concerning the technical contents which were in general supportive, reviewer #1 and the editorial review pinpointed some critical mismatches between the manuscript structure with the *JoVE* taste. In the revised text manuscript, in addition to addressing the minor technical concerns, the manuscript structure has been significantly modified to comply with the *JoVE* style. Revisions of the manuscript have been marked by red.

We hope the updated manuscript can be acceptable for publication in *JoVE*.

Sincerely,

Ming Han

Michigan State University, USA

--------------- Response to Reviewer Comments ----------------

Responses (**bold**) to comments (*Italic*) from reviewers and editor are provided as follows.

Editorial Comments:  
  
*• Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammatical errors.*

Response: **The revision has been carefully proofread.**

*• Protocol Language: The JoVE protocol should be almost entirely composed of numbered short steps (2-3 related actions each) written in the imperative voice/tense (as if you are telling someone how to do the technique, i.e. "Do this", "Measure that" etc.). Any text that cannot be written in the imperative tense may be added as a brief “Note” at the end of the step (please limit notes). Please re-write your ENTIRE protocol section accordingly. Descriptive sections of the protocol can be moved to Representative Results or Discussion. The JoVE protocol should be a set of instructions rather a report of a study. Any reporting should be moved into the representative results.*

Response: **This point has been followed, see the Protocol section of the revision.**

*• Protocol Detail: Please note that your protocol will be used to generate the script for the video, and must contain everything that you would like shown in the video. Please add more specific details (e.g. button clicks for software actions, numerical values for settings, etc) to your protocol steps.**There should be enough detail in each step to supplement the actions seen in the video so that viewers can easily replicate the protocol.  
  
• Protocol Highlight: Please highlight ~2.5 pages or less of text (which includes headings and spaces) in yellow, to identify which steps should be visualized to tell the most cohesive story of your protocol steps. Please see JoVE’s instructions for authors for more clarification. Remember that the non-highlighted protocol steps will remain in the manuscript and therefore will still be available to the reader.  
1) The highlighting must include all relevant details that are required to perform the step. For example, if step 2.5 is highlighted for filming and the details of how to perform the step are given in steps 2.5.1 and 2.5.2, then the sub-steps where the details are provided must be included in the highlighting.  
2) The highlighted steps should form a cohesive narrative, that is, there must be a logical flow from one highlighted step to the next.  
3) Please highlight complete sentences (not parts of sentences). Include sub-headings and spaces when calculating the final highlighted length.  
4) Notes cannot be filmed and should be excluded from highlighting.  
5) Please bear in mind that software steps without a graphical user interface/calculations/ command line scripting cannot be filmed.*

Response: **This point has been followed, see the highlighted texts of the Protocol section.**

*• Discussion: JoVE articles are focused on the methods and the protocol, thus the discussion should be similarly focused. Please ensure that the discussion covers the following in detail and in paragraph form (3-6 paragraphs): 1) modifications and troubleshooting, 2) limitations of the technique, 3) significance with respect to existing methods, 4) future applications and 5) critical steps within the protocol.*

Response: **The original Conclusion section has been changed to Discussion, see the revision.**

*• Figures: Please remove the embedded figures from the manuscript. Figure legends, however, should remain within the manuscript text, directly below the Representative Results text.*

Response: **The point has been followed, see the revision.**

*• Figure/Table Legends: Please expand the legends to adequately describe the figures/tables. Each figure or table must have an accompanying legend including a short title, followed by a short description of each panel and/or a general description.*

Response: **The legends have been enriched, see the revision.**

*• References:**Please make sure that your references comply with JoVE instructions for authors. Citation formatting should appear as follows: (For 6 authors or less list all authors. For more than 6 authors, list only the first author then et al.): [Lastname, F.I., LastName, F.I., LastName, F.I. Article Title. Source. Volume (Issue), FirstPage – LastPage, doi:DOI (YEAR).]*

Response: **The references have been reviewed to comply with the instructions.**

*• Commercial Language:**JoVE is unable to publish manuscripts containing commercial sounding language, including trademark or registered trademark symbols (TM/R) and the mention of company brand names before an instrument or reagent. Examples of commercial sounding language in your manuscript are Ibsen, (SM125, Micron Optics, (InfiniCor300, Corning, Ultrapol, Ultra Tec,  
1) Please use MS Word’s find function (Ctrl+F), to locate and replace all commercial sounding language in your manuscript with generic names that are not company-specific. All commercial products should be sufficiently referenced in the table of materials/reagents. You may use the generic term followed by “(see table of materials)” to draw the readers’ attention to specific commercial names.*

Response: **All the commercial language has been removed in the revision.**

*• Table of Materials:**Please revise the table of the essential supplies, reagents, and equipment. The table should include the name, company, and catalog number of all relevant materials/software in separate columns in an xls/xlsx file. Please include items such as lasers, instruments, fibers, software etc.*

Response: **The Table of Materials has been updated.**

*• If your figures and tables are original and not published previously or you have already obtained figure permissions, please ignore this comment. If you are re-using figures from a previous publication, you must obtain explicit permission to re-use the figure from the previous publisher (this can be in the form of a letter from an editor or a link to the editorial policies that allows you to re-publish the figure). Please upload the text of the re-print permission (may be copied and pasted from an email/website) as a Word document to the Editorial Manager site in the "Supplemental files (as requested by JoVE)" section. Please also cite the figure appropriately in the figure legend, i.e. "This figure has been modified from [citation]."*

Response: **Figure 8(a) of the revised manuscript is modified from Wikimedia Commons which are open to distribute with appropriate attribution.**

Reviewer #1:

*Manuscript Summary:*

*The submission provides a rather comprehensive report of the authors' new sensing platform. It seems, however, to miss the mark in that the spirit of JoVE is in the protocol and performance of the work.  
  
Major Concerns:*

*This misunderstanding is perhaps indicated by the first sentence: "In this video article, we introduce an innovative and practically promising fiber-optic sensing platform (FOSP) that we proposed and demonstrated recently, with an emphasis on the brief introduction of operation principle, demodulation methods, fabrication protocols, and representative applications." But a JoVE submission should be mostly about protocols: sensor fabrication, operation, and testing. Processes.*

Response: **The manuscript has been significantly revised to abide by the JoVE style requirement.**

*Section 1 "System Configuration" describes the physics of the sensor and should be part of an introduction. Please refer to the JoVE template, which specifies an introduction followed by the protocol.*

Response: **The original System Configuration has been removed from the Protocol section and is incorporated in the Introduction part.**

*Section 2 "Fabrication Protocol". The protocol should direct the reader to very specific actions. For example, rather than "A piece of 75 micon-thick DSP silicon wafer is cleaned first", something like "Cut a 75 micron-thick wafer to height-x by width-y. Clean the wafer with solvent-A and material-B by wiping......". Please review and edit the protocol steps to conform to this style.*

Response: **The style has been followed, see the Protocol part of the revised text manuscript.**

*Section 3 "Representative Applications and Results". Most of this section is application background. This section should be restricted to representative results. One or two data plots should suffice along with discussion of their significance. The application photos and schematic are inappropriate for the results section.*

Response: **The application background has been made to be more concise. However, since a brief introduction of the background is necessary for the understanding of the representative results, they are not completely removed. The remaining concise background introduction will not interfere with the overall style, see the Representative Results section.**

*Section 4 "Conclusion". JoVE articles typically end with a "Discussion" section, where the authors comment on the protocol, noting pitfalls or critical steps. Often the interesting and/or novel step(s) of the protocol are highlighted. The authors do not mention the protocol in their closing section.*

Response: **The Conclusion part has been changed to Discussion part.**

*Minor Concerns:*

*The text is generally well-written and clear, but might benefit from a review by a native English speaker. For example, replace "finesse" with "fidelity", "fastness" with "speed", "tokama" with "tokamak".*

Response: **“finesse” is a commonly accepted term for this field, thus it is not changed. The other wording suggestions have been accepted.**

Reviewer #2:

*Manuscript Summary:*

*This video article reports fiber-optics sensors (thermometer, flow meter and bolometer) based on a silicon Fabry-Perot interferometer (Si-FPI). The operation principles, preparation methods and representative practical applications of the sensors were clearly demonstrated. In particular, the interference generated from the reflection of the Si-FPI exhibits spectral shifts induced by temperature which serves as a basis for sensing and this reflection was also tuned by coating the Si sensor head affording either high- or low-finesse sensors. Overall, it was shown that the sensor platforms in this work have better sensing performance (superior sensitivity, thermal resolution and response time) than that of the conventional fiber optics sensors. The significance of the work is clearly highlighted, and the results are well communicated and structured; the manuscript is well written. In my view, this manuscript can be accepted for publication in Journal of Visualized Experiments, after the following concerns are addressed.*

*Major Concerns:*

*1. The sensor parameters should be represented by figures: for instance, in terms of temperature dependent spectral shifts and sensitivity (i.e., temperature vs. spectral shift, temperature vs. sensitivity, etc.).*

Response: **We appreciate that the reviewer brought about an important point. However, since these results on wavelength shift vs. temperature have been well reported by our previous papers (Refs. [2][11-12]), they are not provided in this article to avoid redundancy. In the introduction part, these previous results have been cited explicitly, so that interested readers can refer to.**

*2. Further details on the methods of determining (the experimental or theoretical) temperature resolution and response time should be given.*

Response: **Similar to the point #1 of this reviewer, these results on resolution and response time have been well reported by our previous paper (Ref. [2]), they are not provided to avoid redundancy, but these important aspects have been mentioned in the introduction part.**

*3. Figures should be adequately described in the caption without reference to the text in the manuscript (e.g. Fig. 4).*

Response: **All the figure captions have been enriched.**

*Minor Concerns:*

*4. The authors mentioned that superior sensing performance reported in this work is related to the size of the Si head and to the high thermal conductivity of Si; what would be the theoretical predication of the sensor´s response time and temperature resolution for a much smaller (much thinner) Si cavity/sensors (e.g., nanometric scale size), and what is the limitation to design such a device?*

Response: **Thanks for pointing out an important aspect. The first paragraph of the Discussion part has been added to address this point.**

Reviewer #3:

*Manuscript Summary:*

*The authors successfully demonstrated a miniature fiber-optic sensor. The protocol of fabrication and the result of the measurement are very interesting. I think the achievement is worth to publish.*

*Minor Concerns:*

*I am curious why the authors used the low-finesse type sensor for the measurement of ocean thermoclines.*

Response: **A low-finesse Si-FOSP is demodulated using a high-speed spectrometer that covers a broad band of spectrum, which gives a much larger dynamic range. The high-finesse version can not provide enough dynamic range for this application.**

Reviewer #4:

*Manuscript Summary:  
The paper is interesting and worth to be published. There are only some questions that should be better addressed.  
  
Minor Concerns:  
\*The Authors should clarify why graded-index multi-mode fiber (GI-MMF) that act as collimator have been used only in fabrication of the high-finesse sensor.*

Response: **For a high-finesse sensor, requirement on alignment of the lead-in fiber with the silicon FPI is much higher than a low-finesse sensor. A GI-MMF expands the diameter of the modal field diameter coming out of the fiber, thus, reducing the requirement on alignment. In step 2.2 of the Protocol section, a note has been added to clarify this point. References detailing this point have also been added.**

*\*How do they control the length of the GI-MM fiber ?*

Response: **A fiber cleaver was used to control the length of the GI-MMF under an optical microscope. The requirement on the length of the GI-MMF is not extremely restrict in obtaining a good spectrum. See step 2.2 of the Protocol section.**

*\*How is the fiber collimator affected by the temperature?*

Response: **Firstly, since the ray trajectory within the GI-MMF (i.e., collimator) is not affected much by temperature, the GI-MMF does not bring about much temperature-dependent influence. Furthermore, the notch positions of the spectrum are determined mainly by the silicon FPI, thus temperature of the collimator is not critical. In our experiments, as temperature changed, no distortion in spectrum shape was observed.**

*\*More in information should reported about the fabrication and the characteristic of HR dielectric coatings.*

Response: **The HR dielectric coating was done by a company; thus, the fabrication steps, coating materials, and structure are unknown due to the proprietary protection by the company, see the note of Step 2.1 of the Protocol section.**