Original Manuscript ID: SNA-D-24-01745

Article Title: Effect of Size and Humidity Variations on Rhenium Disulfide-coated Fiber Optic Humidity Sensors: Experimental Analysis and Performance Evaluation.

Dear reviewer,

Thank you for reviewing our manuscript for publication consideration in International Journal of Nanoelectronics and Materials. We are uploading:

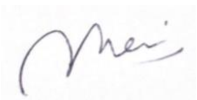
a) Our point-by-point response to the reviewer's comments (Please see the attachment).
b) An updated MS Word manuscript with Blue Font indicates changes (Please see the attachment).

This manuscript has been sent to an English professional editor to improve the quality and language of the manuscript. We want to thank you for your thoughtful comments and efforts toward improving our manuscript.

We confirm that this manuscript has not been published elsewhere and is not being considered by any other journal. All authors have approved the manuscript and agree with its publication in International Journal of Nanoelectronics and Materials. Please do not hesitate to contact us if you have any further inquiries.

Thank you

Best regards,



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RESPONSE TO REVIEWER #1

No	Reviewer's Comments	Response	Page
1	Abstract: The abstract clearly highlight the study but contains repetitive wording regarding the ReS_2 coating. The best-performing structure should be clearly emphasized to strengthen the conclusion i.e ReS_2-coated fiber with 10 μm diameter demonstrates a 6–8% sensitivity improvement.	Thank you for the comment. The abstract has been revised to reduce repetitive wording regarding the ReS_2 coating and to clearly emphasize the best-performing structure. "Notably, the 10 μm ReS_2-coated fiber demonstrated the highest improvement of 6–8% under the tested RH range."	*abstract, page 1*
2.	page 2, column 1, para 1: "Fiber optic humidity.....flammable environment". -Author to remove as the statement is repetitive (refer page 1, column 1, introduction " Traditional humidity....em disturbances")	Thank you for the comment. The statement ""Fiber optic humidity.....flammable environment." Has been removed as suggested.	
3.	page 2, column 1, para 1: "The anisotropic properties of ReS2, stemming from the material's distorted octahedral coordination geometry" This statement requires further clarification especially on how the anisotropic properties influence the performance of ReS_2-based humidity sensors. Please consider including a relevant equation to substantiate this claim and recent studies that investigate the anisotropic properties of ReS_2 in sensor applications.	Thank you for the comment. Further clarification has been added to clarify the influence of anisotropic properties to the performance of ReS2-based humidity sensors and relevant equation has been added with citation. "The anisotropic properties of ReS2, stemming from the ReS2 exhibits a chain like crystal configuration that induces direction dependent light propagation along and perpendicular to the chain axis. Consequently, the coating presents two distinct refractive indices, ηx (chain direction) and ηy (perpendicular direction), with $\eta x \neq \eta y$. [9] Light polarized at an angle φ relative to the chain axis encounters an effective refractive index given by	*page 2, column 1, para 1, equation 1 & 2* *reference*

		$\eta_{eff}(\phi) = \eta_x \cos^2\phi \ + \ \eta_y \sin^2\phi$ RH produce shifts in each principal index, ∂ηx/∂RH and ∂ηy/∂RH. The resulting effective index change follows $\frac{\partial\eta_{eff}(\phi)}{\partial RH} = \frac{\partial\eta_x}{\partial RH}\cos^2\phi \ + \frac{\partial\eta_y}{\partial RH}\sin^2\phi$ Optimal sensitivity results when guided mode polarization aligns parallel to the axis with the larger ∂η/∂RH, thereby maximizing humidity induced index change. This analysis clarifies how ReS2's in plane anisotropy enhances sensor performance [10]."	(1)
4.	page 2, column 1: last line -Author to confirm the correct term whether 'Faber tapering software' or 'Fiber tapering software' and revise accordingly to avoid confusion.	Thank you for the comment. The correct term "Fiber tapering software" has been applied throughout the manuscript to avoid confusion.	*page 2, column 2, para 1*
5.	page 3, column 2, para 4& 5: It is recommended to remove this paragraph as it does not contribute substantively to the technical depth or reproducibility of the experimental procedure.	Thank you for the comment. The paragraphs have been removed from the manuscript as suggested.	
6.	page 4, equation: 1. sensitivity formula - Author to include equation number 2. author to relate the sensitivity formula with the output power measured in this project.	Thank you for the comment. 1. The sensitivity formula has been assigned an equation number. 2. The sensitivity formula has been revised to relate with measured output power in this project.	*page 4, column 1, para 1, equation 3*
7.	page 4, Figure 6,7,8,9,11: 1. Author to provide more presentable figure by improving the resolution, refining axis ranges, legend and figure description.	Thank you for the comment. 1. We have made improvements to the image quality of all figures in the manuscript.	

	2. Author to clarify the reason for the negative output power values shown in the figure.	2. All output power values are reported in dBm, which is decibels relative to 1 mW. Insertion losses, splice and coupling losses, and additional attenuation from the ReS_2 coating reduce transmitted power through both coated and uncoated tapered fibers to below 1 mW, yielding negative dBm readings. This has been clarified in the manuscript too. "However, the resulting negative dBm readings arise because insertion losses, splice and coupling losses, and additional attenuation from the ReS_2 coating reduce transmitted power through both coated and uncoated tapered fibers below the 1 mW reference."	*page 4, column 1, para 4,*
	3. The description of results (pg 4, column 1, para 4,) does not accurately reflect the highlighted power values shown in Figures 6 and 7. The authors should revise this section to ensure consistency between the textual explanation and the actual data presented in the figures.	3. Figure 6 (a) has been re-analyzed and the description for has been revised and corrected based on the data presented in the figures. "Figure 6 shows the performance of each tapered fiber size under various relative humidity concentrations. Based on graph trends, the output power for each size is almost the same, which is in between 0 to -10dBm. In term of wavelength plotted, the wavelength for 7 µm is unstable compared to 4 µm and 10 µm. Furthermore, the wavelength shift for each size is slightly small approximately less than 0.002 nm for 10 µm size diameter. For example, the wavelength shifts at 1549.972 nm to 1549.974 from 40% to 80% humidity and the power increase from -4.52 dBm to -4.17 dBm with 8% increment for this size. Finally, the sensor performance can not be dependent on wavelength shift alone especially for sensitivity and linearity. The output power is the most appropriate to	*page 4, column 2 figure 6 (a)*

	4. Author is advise to adjust the axis ranges in Figure 6 to better highlight the wavelength shift and power variation across humidity levels.	measure the sensitivity and linearity of the sensor [18]. 4. We have adjusted the axis range in Figure 6 to highlight the wavelength shift and power variations across humidity levels.	*page 4, column 2 figure 6 (a)*
8.	page 4 1. Fig. 6,8, 10: Fig. 6 and 10 show increasing power with rising RH, Meanwhile Fig. 8 demonstrates a different trend. author to clarify this inconsistency. 2. Fig 12: The reported R^2 value of 0.79716 shows a linear correlation for the coated fiber. But, the data points (black squares) appear visibly scattered and do not closely follow the fitted line. Author is advised to verify the regression calculation and consider including a residual plot or goodness-of-fit explanation to justify the reported value.	Thank you for the comment. 1. Figure 6 (a- c) were re-generated with bare tapered fibers which meant no sensing film therefore the inconsistency is predictable. The inconsistent result can likely from moisture ingress into the polymer buffer and jacketing, which induces microbending and slight coupling misalignments, temporarily increasing insertion losses at intermediate humidity levels. 2. We have revamped and discussed the result of sensor's performance and plotted the performance of the sensor using different tapered optical fiber size from 4, 7 and 10 μm in Figure 9. "The performance of the sensor is examined the changes of output power versus relative humidity concentration. Figure 9 plot the performance of the sensor using different tapered optical fiber size from 4, 7 and 10 μm. Based on the result in Figure 9, the output power is directly proportional to the relative humidity concentration. This result can be determined and observed by analyzing the sensitivity and linearity of coated fiber. Based on the result, the coated ReS2 improves more 30% for each tapered size diameter. However, the linearity and	*page 4, column 2 figure 6 (a-c)* *page 5, column 2, para 2, conclusion*

		sensitivity of the sensor improve more than 70% for 10 µm tapered size. The linearity is 0.988 and the sensitivity is 0.249dBm/%RH for 10 µm compared to 0.014dBm/%RH and 0.11dBm/%RH for 7 and 4 µm. The sensor performance comparison is summarized in Table 1. Based on the results, the 10 µm is more stable for coated ReS2 compared to other size diameter in terms of the linearity and standard deviation for this size is smaller compared to the other size diameter of tapered optical fiber." Conclusion "7 µm and 10 µm tapered fiber, the presence of ReS_2 coating can increase the sensitivity than the non-coated fiber. The ability of ReS_2 to improve sensor performance has been clearly demonstrated in this experiment."	