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| Book Name: | **Plasmas Afterglows with N2 for Surface Treatments synthesis 2024** |
| Manuscript Number: | **Ms\_BPR\_3686.19** |
| Title of the Manuscript:  | **N2 (B, v'=0-12) Populations in Ar-N2 and N2 Flowing Afterglows at Atmospheric Gas Pressure** |
| Type of the Article | **Book chapter** |

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| PART 1: Review Comments |
| Compulsory REVISION comments | Reviewer’s comment | Author’s Feedback *(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)* |
| **Please write a few sentences regarding the importance of this manuscript for the scientific community. Why do you like (or dislike) this manuscript? A minimum of 3-4 sentences may be required for this part.** | The manuscript presents substantial evidence regarding the analysis of afterglows from microwave Ar-N2 and N2 at low and atmospheric pressure, as well as N2 corona discharge at atmospheric pressure. It provides significant insights into the how different factors affect nitrogen emissions, the behavior of nitrogen excited states and their vibrational distributions, contributing valuable knowledge to the field of plasma physics and its practical applications. |  |
| **Is the title of the article suitable?****(If not please suggest an alternative title)** |  Quantitative evaluation of the densities of Ar-N2 and N2 Flowing Afterglows at Atmospheric Gas  |  |
| Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here. | **NO,** The abstract is inadequate; it should also include a brief introduction to sources of excited and dissociated species of N2, as well as their importance. The authors should also add the source of the gas mixture used, along with the percentage of N2. Additionally, the abstract should have included the wavelength and pressure of the discharge methods. The parameters for the diagnostics were also not included; these should include the temperature of the Plasma, pressure of the plasma, wavelength, and power rate. This information is essential to know and understand the experimental conditions of the system. Furthermore, the characterization band was not specified (pink or yellow) as well as the details about the gas flowrate, densities and vibrational temperature. |  |
| **Are subsections and structure of the manuscript appropriate?** |  |  |
| **Please write a few sentences regarding the scientific correctness of this manuscript. Why do you think that this manuscript is scientifically robust and technically sound? A minimum of 3-4 sentences may be required for this part.** | The manuscript entails comprehensive methodology and thorough analysis of the populations in Ar-N2 and N2 flowing afterglows. The authors employ established experimental techniques, such as emission spectroscopy, to investigate the behavior of excited nitrogen species, which adds credibility to their findings |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.****-** | Although the references are sufficient, but too old (A.Ricard, F.Gaboriau and C.Canal (2008)). The percentage of 2021 and 2022 is negligible, just 2 (1.77%) |  |
| Minor REVISION commentsIs the language/English quality of the article suitable for scholarly communications? | Specific phrases should be revised for precision and clarity. Ambiguous or vague terms must be replaced with more accurate terminology to reflect the scientific rigor of the research.  |  |
| Optional/General comments | In this work, the author provides an overview of **Populations in Ar-N2 and N2 Flowing Afterglows at Atmospheric Gas Pressure**. The organization of the manuscript is satisfactory, the overall structure is adequate, and the content is easy to follow. In my opinion, the work has several merits due to the due to its importance and methods used, and it could potentially merit publication as a book chapter if properly revised. However, there are several issues and comments regarding this manuscript that highlight areas needing improvement or clarification, before publication. My specific comments are as follows:CommentsI have gone through this article entitled “**Populations in Ar-N2 and N2 Flowing Afterglows at Atmospheric Gas Pressure**”. It’s a nice piece of work and has worth to published as a book chapter, yet I have some suggestion given below that I believe will improve the quality of the article.There is a need to make various necessary corrections to improve the clarity, accuracy, and coherence of the provided journal. Therefore, the following revisions are necessary:1. **Abstract in adequate**: The abstract is inadequate; it should also include a brief introduction to sources of excited and dissociated species of N2, as well as their importance.

The authors should also add the source of the gas mixture used, along with the percentage of N2. Additionally, the abstract should have included the wavelength and pressure of the discharge methods. The parameters for the diagnostics were also not included; these should include the temperature of the Plasma, pressure of the plasma, wavelength, and power rate. This information is essential to know and understand the experimental conditions of the system. Furthermore, the characterization band was not specified (pink or yellow) as well as the details about the gas flowrate, densities and vibrational temperature.1. **Introduction**: This section should also include the abundance and sources of excited and dissociated species of N2. The authors should add applications of excited and atomic N2, as well as the importance of the microwave and corona discharge methods, since these were mentioned in your work.

Additionally, the introduction should also include the method of analysis used to measure both intensity and production of N2(B,v’).1. **Proper Use of Grammar and typographical errors**: Authors should ensure that typo graphical errors are checked such as “*A special interest is presently enphasized on the…it is mentionned here”*Use of English language is adequate, although there are typo and some grammatical errors here and there.
2. **Material and methods:** The experimental setup is adequate. The manuscript contains the methodology, especially regarding the methods under consideration, but the manuscript is poorly written, related and summarized. The salient factors are referenced, where they cannot be retrieved. The manuscript should be more comprehensive. Additionally, please clarify, why you referenced the method for N atom density and the TALIF method. A brief explanation will ensure a professional and uniform presentation of the data.

Result and discussionThe authors include the characterization of N2 and Ar–N2, as well as the emission spectra of the sequence. The authors should use equation editor for all equations in this page.They should also briefly discuss the P1/P2 branches intensity of the N2, 777.5 nm band, see details in [6, chap.1.8.3], How? This is unacceptable, because equation for this is missing.Additionally, the authors should ensure that accurate units are used, such as ***slm or Slpm, in some cases, this units have been omitted.*** Also, the value 2.25 10-2 should be written as 2.25 x 10-2, and this format should be consistent across all values in the same category. Please follow the acceptable reference format, the phrase “***directly by TALIF as reported in ref.2”,*** is not acceptable. Finally, the authors should briefly explain NO titration method for measuring N- atoms density methods and include the relevant equation.The peaks in the results, such as figure 19.4 is not clear, please replace them. Additionally, add the emission spectra taken from the afterglows for Ar-23%N2 and Ar-1.5%N2. Although the references are sufficient, but too old (A.Ricard, F.Gaboriau and C.Canal (2008)). The percentage of 2021 and 2022 is negligible, just 2. The authors should itemize the significant comparative differences between the density of the embedding N2 into Ar flow, comparable gas and the afterglows of the pure N2. Authors should itemize the significant comparison differences between the discharge methods and the results obtained. They should also include at least a discussion of multi-step reactions involving associated N +ion density.2Authors need to be more proactive in their writing Many statements appear correct but lack supporting evidence; some references, such as ***ref 11***, cannot be sighted, which undermines the substantiation of claims.1. **Precision in Phrasing**: Specific phrases should be revised for precision and clarity. Ambiguous or vague terms must be replaced with more accurate terminology to reflect the scientific rigor of the research.
2. **Figures**: All figures and tables are intended to enhance the manuscript’s flow and support the data being discussed. The authors should ensure that references are adequate, that the figures comprehensively represent the data, and that they include their appropriate keys. Be consistent.
3. **Referencing:** The references should follow the Journal format. There is need for major review with relevant recent references.
4. **Conclusion**: The conclusion should be revised as it is currently too vague. It needs to adequately summarize the significance of the research. The conclusion should clearly reflect the impact of the findings and suggest potential applications or future directions for research. Additionally, it should clearly reflect the impact of the findings and suggest potential recommendation or future directions for research.

**In conclusion**, these corrections will significantly enhance the overall quality of the manuscript, ensuring that it is accurate, clear, adequate and suitable for a scientific audience. The revised manuscript will demonstrate coherence, scientific rigor, and a proper reflection of the work, aligning with standard scientific methodologies. |  |

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| **PART 2:**  |
|  | **Reviewer’s comment** | **Author’s comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)* |
| **Are there ethical issues in this manuscript?**  | *(If yes, Kindly please write down the ethical issues here in details)* |  |

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| **Reviewer Details:** |
| Name: | **Aduloju Emmanuel I** |
| Department, University & Country | **Universiti Sains Malaysia, Malaysia** |