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| Book Name: | **Plasmas Afterglows with N2 for Surface Treatments synthesis 2024** |
| Manuscript Number: | **Ms\_BPR\_** **3686.9** |
| Title of the Manuscript: | **N2 Active Species in Microwave Plasma and Early Afterglows at Low 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.** | This manuscript provides valuable insights into the behavior of nitrogen-active species in microwave plasmas and early afterglows, which is highly relevant for applications such as surface treatment and material processing. The integration of experimental and theoretical approaches enhances our understanding of plasma kinetics and the production of radiative states, contributing to advancements in low-pressure plasma research. I appreciate the comprehensive nature of the study, as it bridges the gap between experimental observations and theoretical modeling, offering a robust framework for future investigations |  |
| **Is the title of the article suitable?**  **(If not please suggest an alternative title)** | The title **"N2 Active Species in Microwave Plasma and Early Afterglows at Low Gas Pressure"** is clear and appropriately reflects the content of the manuscript. |  |
| 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. | The abstract is comprehensive and provides a clear summary of the study's objectives, experimental conditions, key findings, and conclusions. It effectively communicates the focus on nitrogen active species, the plasma and afterglow conditions, and the insights gained from the theoretical model.  **Suggestions for Improvement:**   * Including a brief mention of potential applications, such as plasma-based surface treatments or material processing, would make the abstract more impactful and highlight the practical relevance of the study. * Briefly mentioning the two setups and their differences would provide a more rounded summary of the experimental design.   **Sentence improvement**  **Current:** *"The plasma and pink afterglows have been analyzed in a setup where the end of the plasma was directly connected to a larger post-discharge tube."*  **Revised:** *"Two experimental setups were analyzed: one with the plasma directly connected to a larger post-discharge tube and another with the introduction of an Ar-NOext mixture, providing insights into the role of external interactions."* |  |
| **Are subsections and structure of the manuscript appropriate?** | The subsections and structure of the manuscript are appropriate and well-organized. The logical flow from the introduction to experimental setups, theoretical modeling, results, and conclusions makes it easy for readers to follow and understand the research. |  |
| **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.** | This manuscript is scientifically robust and technically sound, as it combines a well-structured experimental investigation with a comprehensive theoretical model. The experimental setups are clearly designed to capture the dynamics of nitrogen active species under low-pressure plasma conditions, and the results are supported by quantitative data, including emission spectra and temperature profiles. The self-consistent theoretical model effectively explains the production mechanisms of radiative species and aligns well with the experimental findings, reinforcing the reliability of the conclusions. The detailed inclusion of reaction pathways and kinetic equations further demonstrates the scientific rigor of the work. Minor improvements in linking some experimental observations with broader implications could make it even stronger. |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.**  **-** | The manuscript includes a wide range of references that provide a strong foundation for the study, particularly in the areas of nitrogen plasma kinetics and afterglows. However, a significant portion of the references are over a decade old, which may not fully reflect recent advancements in the field. Incorporating more recent studies, particularly those published in the last 5–10 years, could enhance the manuscript’s relevance and demonstrate its connection to contemporary research. Also, I recommend adding some literature to show the broad range of applications of plasma. Cite the following article in the revised version:   1. https://doi.org/10.1002/ctpp.202400036 2. https://doi.org/10.1016/j.jcou.2023.102473 3. https://doi.org/10.1007/s11090-024-10510-7 |  |
| Minor REVISION commentsIs the language/English quality of the article suitable for scholarly communications? | The language and English quality of the article are generally suitable for scholarly communication. The manuscript is clear and understandable, with technical terms appropriately used to describe the experimental and theoretical work. However, there are occasional instances where sentence structure or phrasing could be improved for better readability and fluency. |  |
| Optional/General comments | To further enhance the manuscript, consider the following suggestions:   * Update the reference list with more recent studies to reflect advancements in nitrogen plasma research and its industrial applications. * Provide more detailed explanations or diagrams of the experimental setups to aid in understanding the configurations and their implications. * Enhance the clarity of certain figures by improving labeling and adding concise descriptions in the text. |  |

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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: | **Sohail Mumtaz** |
| Department, University & Country | **Kwangwoon University, South Korea** |