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| Book Name: | **Plasmas Afterglows with N2 for Surface Treatments synthesis 2024** |
| Manuscript Number: | **Ms\_BPR\_3686.13** |
| Title of the Manuscript: | **Study of Microwave Afterglows in N2 Gas Mixtures by Emission Spectroscopy and LIF. Application to Surface Cleaning** |
| Type of the Article | **Complete 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 holds significant importance for the scientific community as it contributes to the fundamental understanding of plasma afterglow behavior and atom interactions, which are key for developing advanced material processing methods like nitriding and surfaces cleaning . It highlights how precise control of gas mixtures and plasma conditions can influence atom densities and reaction kinetics, offering practical insights for optimizing industrial applications.  The study is well-supported by a sufficient number of references, ensuring that the presented work is grounded in a robust scientific framework. The comprehensive citation of prior studies provides a clear context for the research and highlights how it advances the field.  However, the introduction section could benefit from further clarification to better identify the scope and objectives of the research. Clearly outlining the research questions, the specific gaps in the existing literature, and the contributions of the study would enhance the manuscript’s accessibility and impact. This refinement would help readers from diverse backgrounds understand the significance of the work and its relevance to both fundamental science and applied technology.  This work not only underscores the potential for plasma technology in various sectors but also provides a solid foundation for future research, promoting innovation in areas such as surface engineering, thin-film deposition, and surfaces cleaning. Its clear articulation of both challenges and opportunities ensures its relevance to a broad audience, including academics, industry professionals, and policymakers. |  |
| **Is the title of the article suitable?**  **(If not please suggest an alternative title)** |  |  |
| 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 not comprehensive. The abstract should consist the main result which gented in the chapter (N and C-atom density that obtained by deffrernt methods) the reader should have indection to the chapter afer finish reading of the abstract. |  |
| **Are subsections and structure of the manuscript appropriate?** | In introduction the experiment which referd to it (LSGS(Nancy), Plasmas Lab (Montreal), LPGP (Orsay), Laplace (Toulouse) and SNPE (Bordeaux)) each experiment was put main section, but the toulouede have more experiment main section ( should include it in the introduction as separate experiment or make it as subsections to the main section ’’Toulouse’’  Section 13.7 strated in results and it consist subsection (Conclusion of the 13.7 part) is not correct to name paragraph in this name as will asis not correct put concluction for spesified section . |  |
| **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 a comprehensive review of past studies, making it a valuable resource for the scientific community by consolidating existing knowledge on plasma afterglow behavior and atom interactions. It critically examines a wide range of experimental techniques, such as NO titration and spectroscopic analysis, highlighting their effectiveness in measuring atom densities with precision and reproducibility. The review systematically discusses the role of varying gas mixtures, pressures, and plasma conditions, providing insights into how these factors influence atom densities and reaction kinetics across different studies.  The manuscript contains a detailed examination of experimental methods, including those used in previous experiments conducted with N₂-O₂, N₂-H₂, and N₂-CH₄ gas mixtures. Significant studies fulfilled by leading research facilities—such as LSGS (Nancy), Plasmas Lab (Montreal), LPGP (Orsay), Laplace (Toulouse), and SNPE (Bordeaux)—are thoroughly reported. These experiments are critically reviewed to highlight their contributions to understanding plasma chemistry and afterglow dynamics. By covering a diverse range of experimental setups, this review provides a holistic view of how different conditions and gas combinations impact the plasma state and its subsequent behavior.  The integration of theoretical models, including reaction kinetics and density equations, is also thoroughly evaluated, demonstrating how these frameworks have been used to interpret experimental data and validate observed phenomena. The manuscript features an extensive compilation of charts, tables, and reaction mechanisms from these reviewed studies, effectively summarizing key findings and providing a comparative perspective. These visual elements offer readers a clear and concise understanding of trends, correlations, and the evolution of research in this domain.  Furthermore, the review critically compares and contrasts the findings of prior studies, identifying gaps in the current understanding and areas where future research is needed. By doing so, it not only enhances the contextual relevance of the findings but also serves as a roadmap for advancing plasma-based material processing methods. The manuscript’s clear organization, meticulous analysis, and comprehensive coverage make it an indispensable reference for researchers, industry professionals, and policymakers working in fields such as nitriding, diamond deposition, and surface engineering. |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.**  **-** | **-**the references is sufficient, but every chart or digram from [ast research should included the reference of it.  -the reference no 1 mented for it a lot (some times didnot explain the process only mention to the reference  To more clairly should explain in the details and refer to reference). |  |
| Minor REVISION commentsIs the language/English quality of the article suitable for scholarly communications? | Clear language . |  |
| Optional/General comments | - Expanding the discussion to include broader implications or potential applications of the findings could also increase the manuscript's relevance to a wider audience.  - In section 13.7.2 mented to reaction rate unit (cm6s-1 ) it confused unit.  -Some time referd to charts and it not included in this chapter to e more clairly and easer to reader to access for it mention to the chapter or reference of these charts.  - Theientroduction needs further clarification make the reader know this chapter is review for past experminets for other researchers |  |

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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:** | **Najeh Alali** |
| **Department, University & Country** | **Al-Ayen Iraqi University, Syria** |