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| Book Name: | **Plasmas Afterglows with N2 for Surface Treatments synthesis 2024** |
| Manuscript Number: | **Ms\_BPR\_** **3686.7** |
| Title of the Manuscript: | **Plasma Sources for a High Flux of Active Species** |
| 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 generation of O, N, and partly H atoms by means of microwave gas discharge is considered in detail in this work. The influence of various physical parameters (temperature of plasma electrons, collision lengths of atoms, dissociation times of molecules) on the maximum yield of atomic excited components is analysed. Optimal variants of chamber design and experimental conditions such as gas pressure and discharge power are analysed.Much attention is paid to the designs of probes by means of which the diagnosis of metastable atoms is carried out, and this gives great credence to the absolute values of the values of the densities of metastable particles, which the authors give in their graphs. |  |
| **Is the title of the article suitable?**  **(If not please suggest an alternative title)** | Yes, it is. |  |
| 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. | Yes, the abstract accurately represents the content of the article. |  |
| **Are subsections and structure of the manuscript appropriate?** | Yes, the structure of the article is correct. |  |
| **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 paper presents the results of thorough studies of metastable atom generation in gas discharges. The processes of particle interaction in the discharge plasma have been analysed professionally. These results have been published in leading physics journals (as can be seen from the references in the text). |  |
| **Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.**  **-** | In my opinion references to publications are sufficient. |  |
| Minor REVISION commentsIs the language/English quality of the article suitable for scholarly communications? | I think the English is quite good. |  |
| Optional/General comments | There are some comments on the text on the pages:  p. 141: «… For example, nanostructured materials of appropriate morphology will always exhibit high loss coefficients, regardless of the surface composition, because the atoms are trapped within the gaps inside the nanostructured material and suffer numerous surface collisions before they manage to escape the gaps.» - *Such a statement is intuitively correct, but the research text of the article does not explore such a connection.*  p. 143: «…The continuous feeding of the gas from one side and the pumping of the experimental chamber up to an ultimare pressure of 106 Torr with a roots vacuum pump backed…» – *Error, it should be 10-6*  p.146: «…The destruction of Ar metastable atoms is very sensitive to the low energy electrons: at the electron energy of 0.5 eV, the density of argon metastables Ar(3P2) should be between 1012 and 1013 cm-3, but reduced between 1011 and 1012 cm-3 at 3 eV, thus an order of magnitude lower [6].  Anyway, the Ar metastable atoms density appears to be largely lower than 1014 cm-3 as previously  calculated [7].» - *you should have written about the physical cause of the phenomenon.*  p. 148: «…The dissociation cross-section then decreases with a further increase of the electron energy» . – *It would be very useful to provide a link where one could see what exactly is the measured dependence here, if such publications exist. Or indicate the range of energies when such a decrease becomes quite significant (e.g., decreases by an order of magnitude.*  p.148: «…But such three body collisions are infrequent at low pressures. The probability for collisions like those in equation (4), increases as the square of the pressure as long as other gas parameters are constant. The loss of atoms at low pressures is, therefore, almost exclusively on surfaces» - *in brackets it is necessary to specify gas pressures, at which intensive triple collisions begin, this is about 1 mm and higher.*  p.164 «…As a consequence, the afterglow time decreased from 2×102 s to 10-3  s, which was found sufficiently short to allow for a decent density of H atoms in the Pyrex reactor».  *There's probably a mistake here, should it be 2x10-2?*  *The authors do not give anywhere the density values of the plasmas in which, in fact, the excited components are born. If such measurements are difficult for some reason, it would be necessary to give at least in some experiments the saturation ion current density of the plasmas under study****.***  *In general, the paper contains valuable experimental material on the values of densities of metastable atoms which are generated in different types of gas discharges and, undoubtedly, can be recommended for publication.* |  |

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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: | **Mykola Svavil’nyi** |
| Department, University & Country | **G V Kurdyumov Institute for Metal Physics of NAS of Ukraine, Ukraine** |