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Ref: Evaluating research contributions of Dr. Sultana N. Nahar   2012
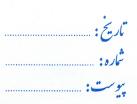
Dear Sir/Madam

   As the lecturer of the Mechanical Engineering Department of Islamic Azad University, Saveh Branch, I am proud to write my strongest support for the research contributions of Dr. Sultana N. Nahar and take the opportunity to express my deep appreciation for her kind guidance in atomic physics of the engineering research projects I have been working on during the last few years. My name is VahidReza Adineh and my main research interests are advanced machining processes including plasma processing. In one research topic, I deal with modeling the plasma machining of materials using electrical discharges. To do this, I need to calculate the amount of radiative heat loss from machining plasma column to the surrounding environment. Calculation of this amount of energy loss is a vital parameter because: 1) it appears as a sink term in the energy balance of plasma equation based upon fluid description 2) it could be used to analyze the strong influence of the absorption for the first millimeters of thickness in the plasma processing 3) and to examine the plasma-surface interactions. Fortunately, my research studies have resulted in 2 journal papers, one in the Journal of Plasma Chemistry and Plasma Processing and the other in the IEEE Transaction on Plasma Science, both in press. The rest of the results from my study are in the 3rd paper which is about to be submitted to the Journal of Physics D: Applied Physics. I have attached the two journal papers along with this evaluation letter. In both of them, I have referenced NORAD-Atomic-Data webpage.

   There are three types of radiative processes responsible for the above mentioned energy loss including free-free, free-bound and bound-bound emissions. For my calculations, I found several unique characteristics in the NORAD-Atomic-Data page which I did not see them in the similar databases such as National Institute for Standards and Technology (NIST), IAEA ALADDIN Database, NIFS AMDIS Database, CAMBD Collisional Processes and so forth. These unique features are as following:

- The NORAD-Atomic-Data database presents its data in an appropriate electronic form. This type of presenting the entries enhances writing any code for implementing the database. In my study, after downloading the data, I easily converted them into an excel file and finally exported them into MATLAB software for further processing. To my knowledge, other databases do not have such feature.

- The database of NORAD-Atomic-Data presents data with highest accuracy and details. For instance, for calculations of free-bound emission mechanism (in the temperature and pressures of machining plasmas, this type of emission is the dominant source of radiative heat loss and hence the most significant one) for each species, a huge amount of values of photoionization cross sections have been prepared. As a case in point, for my study I found more than 55,110, 442,663 and

423,594 entries of photoionization cross sections for hydrogen, Oxygen and carbon species, respectively. Table 2 of first paper (the published paper in the Journal of Plasma Chemistry and Plasma Processing) and Figure 5 of second paper (the published paper in the IEEE one), proves this point. These table and figure relates to the comparison of my calculations with other author and shows how usage of NORAD-Atomic-Data database resulted in higher accuracy in my study (see for instance the sharp lines of figure 5 with smooth lines of other author: This is because of the fact that another author uses a database which represents the values with interpolations for frequencies, while NORAD-Atomic-Data database presents values for each frequency with high accuracy).

- For bound-bound calculations, the NORAD-Atomic-Data database presents the necessary line information for all of possible energy levels including measured levels and theoretical ones, while other databases report only the measured one. See for instance the figure 8(a) and 8(b) of the first paper as well as figure 11 and 12 of the second paper.

Thus, to my knowledge, the NORAD-Atomic-Data database is the best resource for opacity calculations from different points of view. It is for these reasons that I would like to express my highest recommendation for Dr. Nahar's research contributions. My research project would not have been possible without the support of NORAD-Atomic-Data page.

Besides, as I have acknowledged Dr. Nahar's kind help in my research study in the Acknowledgement part of my papers, and I want again to express my deepest gratitude for her patient to answer all of my questions regarding various topics of NORAD-Atomic-Data page. This is because I am coming from engineering side and I had several basic physical questions that her responses were abundantly helpful and she offered invaluable assistance.

Please feel free to contact me if you have further questions.

Best Regards,

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