3rd Asia-Pacific Conference on Plasma Physics, 4-8,11.2019, Hefei, China

Measurement of Floating Potential and Ion Concentration in Arc Plasma at Atmospheric Pressure

Vijay Kumar Jha[1], Lekha Nath Mishra[2], Bijoyendra Narayan[3]

[1]Central Department of Physics, Kirtipur (Tribhuvan University), Kathmandu, Nepal

[2]Patan Multiple Campus, Patandhoka, Lalitpur (Tribhuvan University, Kathmandu), Nepal

[3]J. L. College, Hajipur, Vaishali (B. R. A. Bihar University, Muzaffarpur, Bihar), India

e-mail (speaker): jhav7050@gmail.com

Abstract

Arc plasma is produced using low voltage dc power supply for the measurement of plasma parameters such as floating Potential and ion-concentration in the plasma seeded with Silica. Langmuir moving probe is used in order to measure the probe current at different values of the dc potential applied on the probe. A graph is plotted between the probe current and the probe potential, based on data at the atmospheric pressure, using the experimental set up in the chamber for the single probe method. The floating potential is calculated to be 32V, and the average ion-concentration to be $1.43\times10^{16}m^{-3}$.

Introduction

Measurement of Plasma Parameters (Pulinets et al., 2016; Mishra et al., 2004) is of immense importance for plasma processing (Ben Salem et al., 2014; Robert & Brian, 20**17).** However, its inner temperature is high enough to get the probe melted in a fraction of second when placed in it. The probe is, therefore, kept moving through the arc. Plasma parameters such as floating potential (V_F) and ion-concentration (n_i) are calculated using Langmuir Probe (Robert & Brian, 2017).

Result and Discussion

Figure 1 shows the variation in probe current (*ln I*) with probe potential (*V*) in the molybdenum seeded arc plasma. The lower portion of the curve represents ion-current.

It is obvious from Figure 1 that the floating potential in the arc plasma is 32V. The maximum Ion-concentration for ion-current of magnitude 3.998μA is $2.41\times10^{16}m^{-3}$.

Conclusions

This piece of study is expected to provide a new perspective for the industrial applications such as plasma processing, plasma torch of high efficiency etc.

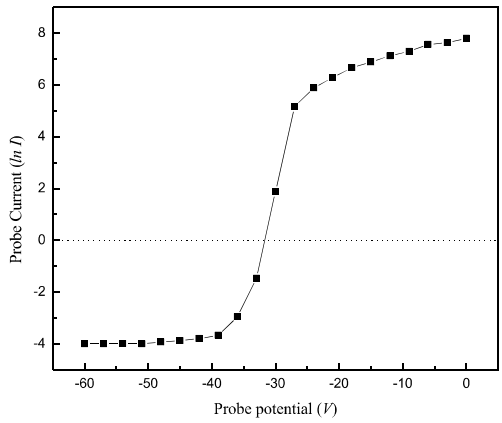

Figure 1: *I-V Characteristics for single probe method*

Acknowledgements

The financial support for the present study by the University Grants Commission (UGC), Nepal, is appreciated.

References

Ben Salem, D.; Carton, O.; Fakhouri, H.; Pulpytel J. and Arefi-Khonsari, F. (2014). Deposition of water stable plasma polymerized acrylic acid/MBA organic coatings by atmospheric pressure air plasma jet. *Plasma Processes and Polymers,* **11**: 269-278.

Mishra, L. N.; Shibata, K.; Ito H.; Yugami, N.; Nishida, Y. (2004). Characteristics of electron Cyclotron resonance plasma Generated in a rectangular wave guide by high power Microwave. *Review of Scientific Instruments*, **75**: 84-89.

Pulinets, M. S.; Kirpichev, I. P. and Antonova, E. E. (2016). Variations in Plasma Parameters and Magnetic Field upon Magnetopause Crossing at the Main Phase Maximum of the Magnetic Storm of November 14, 2012. *Geomagnetizm and Aeronomiy*, **56**: 673–681.

Robert, B.L., and Brian, E. B. (2017). Recommended Practice for Use of Langmuir Probes in Electric Propulsion Testing. *Journal of Propulsion and Power*, **33**: 566-581.