

Enhancements of plume characteristics of low power atmospheric pressure Ar plasma with electromagnet

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In some applications like plasma welding, magnetic field enhances plasma production and stability. In this study, solenoid electromagnet is installed to produce a local magnetic field improving the plume characteristics of low power atmospheric pressure Ar plasma as shown in Figure 1. The current supply used in the electromagnet varied from 50-90 A has magnetic flux density spatial profile as shown in Figure 2. The 2 L/min Ar gas flows inside the quartz tube and it is regulated using a gas flow meter. The Ar plasma develops upon generating current from the 13.56 MHz RF power supply to the 2-mm diameter copper wire wound helically (4 turns) around a 5.7 cm long quartz dielectric tube (5 mm ID, 7 mm OD). Produced plasma emits line radiations of N_2^+ (356.18 nm) and Ar (763.51 nm) as shown in Figure 3. Increase in intensity ratio of N_2^+ and Ar (Figure 3) and total ion density (Figure 4) is observed with increasing electromagnet current at position C.

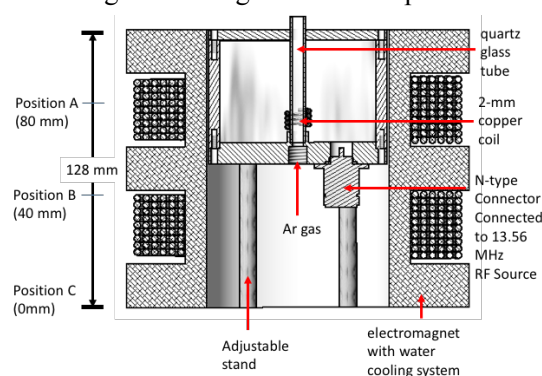


FIG. 1 Experimental setup for the atmospheric pressure Ar plasma with electromagnet.

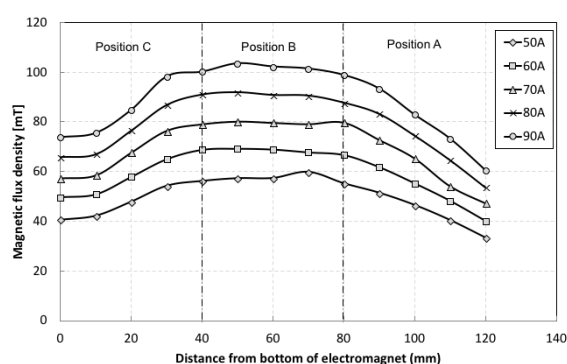


FIG. 2 Magnetic flux density profile at positions A, B, and C at different electromagnet current.

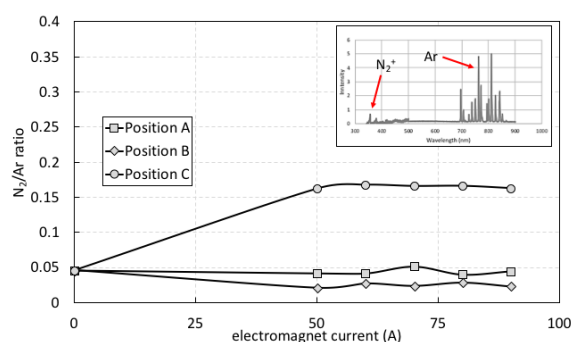


FIG. 3 Intensity ratio of N_2^+ (356.18 nm) and Ar (763.51 nm).

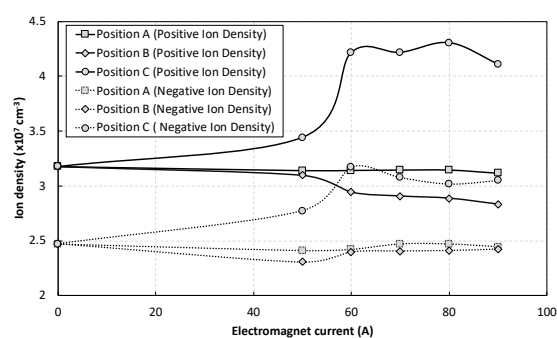


FIG. 4 Total ion density measurements with increasing electromagnet current.

References

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