

Effects of the Driving Frequency on Generation of O₃, NO_x in DBD plasma

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The effects of driving frequency on generation of plasma reactive species were investigated in air plasma. The conventional dielectric barrier discharge(DBD) type plasma source and frequency tunable power were selected as a plasma generator. The frequency was considered as the main factor affecting the generation of plasma reactive species at air DBD plasma. The plasma reactive species, such as O₃, NO, NO_x were measured with different frequency condition (operating range is from 100Hz to 8000Hz). Electrical and optical characteristics were additionally measured. Experimental results show that the plasma reactive species are changed according to the frequency. It is considered that the plasma reactive species can be selectively generated through the frequency control.

1. Introduction

Air plasma application technology can be applied in various fields such as agri-food, environment, and energy. The O₃ and NO_x are important chemical species of air plasma and these are utilized as a sterilizer. There are many ways to control plasma reactive species. The O₃ generation can be controlled through the driving frequency at the oxygen plasma source.[1] It is considered that O₃ and NO_x can be controlled through the driving frequency at the air plasma.

2. Experimental Set-up

The experimental set-up for this study is shown in Figure 1.

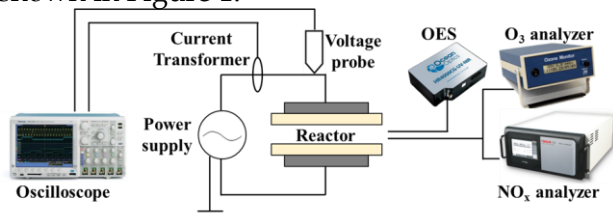


Figure 1. Experimental Set-up

A function generator and a high voltage amplifier were used to control the frequency. O₃ and NO_x were measured using gas analyzers. Electrical properties were measured using an oscilloscope and optical properties were measured using OES.

3. Results and Conclusions

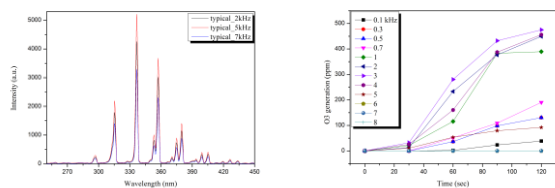


Figure 2. OES (a) and O₃ generation(b)

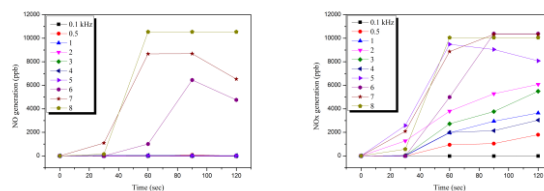


Figure 3. NO and NO_x generation

As the frequency changes, the generation of reactive species is also changed. In this experimental condition, the O₃ concentration increases with frequency and gradually decreases from 3kHz.(Fig. 2(b)) The NO_x concentration steadily increases with frequency and is highest at 8kHz.(Fig. 3) As a result, it is considered that the generation of plasma reactive species can be controlled by frequency.

4. Acknowledgements

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5. References

- [1] Seung-Lok Park, Jin-Gyu Kim. J Korean Inst. Illum. Electr. Install. Eng. Vol. 18, No.5 (2004) 146-150.