The 10th East Asia Joint Symposium on Plasma and Electrostatics Technologies for Environmental Applications (**EAPETEA-10**): 3-5 December, 2025

Plasma leads the future toward low carbon society

Tom Einstein[2], Hans Haber[1], Corona Plasma[1,*], Philipp Langmuir[2]

[1] School of Materials Science and Engineering, EHD National University, Japan
[2] Department of Electrical and Electronic Engineering, Bio Institute of Technology, Japan

Email: corona-plasma@academia.ac.jp (Corona Plasma)

Nowadays, the interest of nonthermal plasm (NTP) technology for nitrogen fixation is rapidly growing due to its ability to produce valuable nitrogen-containing compounds from air, which is favoured over NH_3 production in Haber-Bosch (HB) process. Recently, a few works have paid attention to the importance of the temperature on nitrogen fixation in NTP, due to the capability of gas heating for shifting and controlling the reactions in NTP and for increasing the vibrational excitation of N_2. However, gas heating in plasma reactors affects the plasma characteristics from different points of view; for example, it may cause a decrease of nonequilibrium degree in the discharge, which could lead to a drop in the generation efficiency of desired reactive species. Gas temperature also significantly affects the chemical reactions in the plasma processes.

Thus, the main objectives of this work were to study systematically the effect of the temperature on the nitrogen fixation in a pulsed DBD, and to determine the correlation between the effect of the temperature

It is found that the temperature has a slight effect on the electrical characteristics of the reactor. In addition, it is observed that the total amount of fixed nitrogen was almost independent on the temperature, but it was slightly dependent on the humidity level.

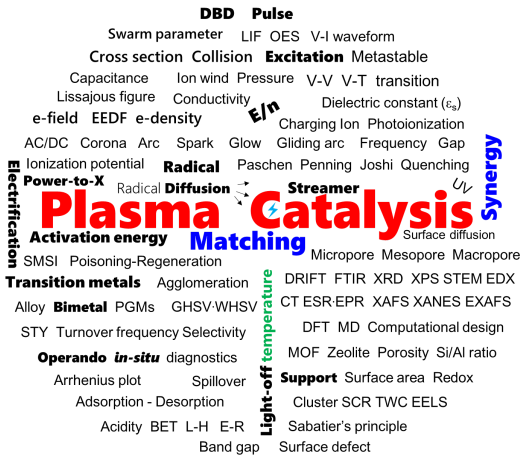


Fig. Important keywords in plasma catalysis.

References

[1] Loeb, L. B.; Meek, J. M., *J. Appl. Phys.* **1940,** *11*, 438-447.
[2] Mizuno, A.; Clements, J. S.; Davis, R. H., *IEEE Trans. Ind. Applicat.* **1986,** *22* (3), 516−522.
[3] Kogelschatz, U., *IEEE Trans. Plasma Sci.* **2002,** *30* (4), 1400–1408.