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Chairperson: Alex Fridman
Drexel University, Philadelphia, PA

Oral Session 6D:
Medical, Biological and Environmental Applications

6D1

MOLAR RATIO DEPENDENCE OF DENOX BY AMMONIA RADICAL INJECTION USING INTERMITTENT DIELECTRIC BARRIER DISCHARGE

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Nitric oxide (NO) gases have been decomposed by an ammonia radical injection system. The ammonia radicals were produced in an intermittent dielectric barrier discharge (DBD) plasma in a separated chamber, and were injected in the NO gas flow-field to reduce NO molecules. The intermittent power source with a one cycle sinusoidal output power easily controls the energy consumed in the ammonia/argon plasma so as to obtain a high energy efficiency of DeNOx. As a result, the energy efficiency of approximately 250 g/kWh with assistance of the thermal heating of the NO gas[1] was obtained.

It was found in evaluating the DeNOx characteristics that the energy efficiency was correlated by the residence energy density (*RED*) for a variety of plasma generation parameters such as ammonia concentration and flow rate, gap length of the DBD reactor, applied voltage and consumed power. In order to realize higher energy efficiency, there are more parameters to be discussed for the plasma generation. One is a molar ratio, which is defined as the number of ammonia particles divided by the number of NO particles in a unit time, and the other is the electrode configuration. In our case, the energy efficiency increases with increasing the molar ratio from 0.2 to approximately 1.0, and tends to saturate. This is closely related to the gas kinetics of NO decomposition. The opening ratio of a mesh type grounded electrode also affects the plasma initiation voltage, which causes the change of the energy consumed in the plasma. Under the experimental conditions, larger area of the electrode shows low initiation voltage to reduce the consumed power to bring a high energy efficiency.

[1] K.Yukimura, K.Kawamura, S.Kambara, H.Moritomi, T.Yamashita, "Correlation of energy efficiency of NO removal by intermittent DBD radical injection method", IEEE Trans. Plasma Science (2005, in print).