-NOx Removal Using Dielectric Barrier Discharges in a Wire cylinder Reactor Stressed by High Pulse Voltage

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Abstract:

This paper is aimed at investigating the nitrogen oxides (NOx=NO+NO2) removal using dielectric barrier discharges (DBD) in a wire-cylinder reactor filled with dielectric pellets and stressed by high pulse voltage. The effects of various parameters (the voltage amplitude, frequency, gas flow rate, and use of the dielectric pellets) on the discharge power and NO/ NOx removal efficiency have been studied experimentally. Two dielectric materials (-alumina and glass pellets) were evaluated for their ability to reduce NOx using non-thermal plasma. To improve the NOx removal efficiency, the output of the plasma reactor was pumped into sodium sulfite (Na2 SO3) solution with different concentrations to absorb NO2. It has been found that the discharge power and NO/ NOx removal efficiency increase with the increase of the applied peak voltage and frequency. On the other hand, the discharge power is independent of the gas flow rate, while the NO/ NOx removal efficiency increases with decreasing gas flow rate. The -alumina pellets give the best performance for removing both NO and NOx when compared with others due to their ability to oxide NO to NO2 and absorb the resulting NO2. The NOx removal efficiency increases with the increase of the concentration of sodium sulfite solution.

Keywords:

-alumina pellets , Dielectric barrier discharges , NO removal , ac high voltage , multi-rod DBD reactor , pulse voltage

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