CONVERSION OF NITROGEN OXIDES BY THE ATMOSPHERIC HOLLOW CATHODE DISCHARGES*

Hana Baránková and Ladislav Bárdos
Uppsala University, Angstrom Lab, Plasma Group, Box 534, SE-751 21 Uppsala, Sweden

A variety of atmospheric pressure plasma technologies are being applied and developed for conversion of hazardous gases. Because of rather high electric fields needed for generation and maintenance of air discharges at atmospheric pressure many plasma systems were found to create considerable concentrations of NO instead of removing NO.

For efficient reduction of nitrogen oxides, well controlled, stable, non-equilibrium, low-power consumption, low-temperature and diffuse plasmas operating without streamers in molecular gases, are required. High frequency and pulsed DC powered hollow-cathode discharges[1], where the incident power is delivered into fast oscillating electrons[2] are very promising for this purpose. However, the generation and stable performance of hollow cathodes at atmospheric pressure require a specific design[3]. We have successfully tested the Fused Hollow Cathode (FHC) with aerodynamic stabilization as a 100% oxidation catalyst in conversion of NO_x in air mixtures. Plasma chemical kinetics and the processing window width are controlled by plasma characteristics. Results show that besides the plasma source design itself the material of the electrodes plays a crucial role. It was found that by using graphite electrodes a 100% removal of NO from the air mixtures is possible without necessity of adding hydrocarbons[4]. The paper presents results of oxygen screening and discusses the mechanisms of the process.

1. H. Baránková and L. Bárdos, "Hollow Cathode and Hybrid Atmospheric Plasma Sources", Pure and Applied Chemistry **80** (2008) 1931-1937.

2. D. Söderström, H. Baránková and L. Bárdos, "On dimensions of atmospheric pressure hollow cathodes", IEEE Trans. Plasma Sci. **35** No.3 (2007) 522-526.

3. H. Baránková and L. Bárdos, "Design and Performance of the Hollow Cathode Cold Atmospheric Plasma Sources", in *Jahrbuch Oberflächentechnik 2008-BAND 64*, edited by R. Suchentrunk (Eugen G. Leuze Verlag KG, Bad Saulgau, 2008), in 2.2. ISBN: 978-3-87480-245-1.

4. B.M. Penetrante, R. M. Brusasco, B. T. Merritt and G. E. Vogtlin "Environmental applications of low-temperature plasmas", Pure and Applied Chemistry **71** (1999) 1829-1835.

* Work supported by Swedish Foundation for Strategic Environmental Research, MISTRA.