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NITRIC OXIDE (NO) REMOVAL AND PULSED DISCHARGE CURRENT ANALYSIS IN VARIOUS NO, N2, O2 AND H2O GAS MIXTURES

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In this paper, dielectric barrier discharges were investigated for nitric oxide removal in a cylindrical electrode configuration. Reactive species like O, O3 and OH were analyzed in various different NO, N2, O2 and H2O gas mixtures.

The mechanism of nitric oxide removal was found to be dependent upon the reactive species participating in the NO removal reaction. For a gas mixture of N2, O2 and NO (concentration of NO in the range from 200 ppm to 1000 ppm), NO2 formation was independent of O2 concentration from 4.76% to 16.67%, due to the reverse reaction of NO2 and O to form NO and O2. However, when the initial concentration of NO was reduced to 100 ppm or lower, NO oxidation was due to the oxidation of O3, and higher NO oxidation rate was observed with increasing oxygen concentration. When H2O vapor was added, OH radicals were produced; these OH radicals catalytically destroyed O and O3, but also reacted with NO and NO2 to form nitrite and nitrate.

In terms of the pulsed discharge current, when the composition of the gas mixture was N2 and O2 (concentration of O2 was 4.76%), the pulsed current had a magnitude of approximately 10 to 30 mA. When 1000ppm NO was added to the gas mixture, the magnitude of the pulsed current increased significantly, to hundreds of mA. However, when 2.26% of H2O vapor was added, no matter whether or not 1000ppm NO was present, the magnitude of the pulsed current fell to lower than 20 mA.

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