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Spectroscopic study of a DBD-discharge for waste gas treatment

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Biological sources of air pollution like animal farms, food processing, sewage and waste handling industries are of increasing concern as the risks posed by the pollutants from these sources are understood more profoundly. The current method investigates the possibility of using a low temperature plasma to treat pollutant gases. Multiple parallel powered steel electrodes are separated with ceramic plates to create a dielectric barrier discharge.
Spectroscopic investigations show that the blue-violet light emission origins only from one electronic transition of the N_2 molecule. A view into literature reveals the $2^{nd.}$ positive system as the rotational-vibrational band from the state $C^3\Pi_u$ to $B^3\Pi_g$. Mainly the vibrational transition from $\Delta v=+3$ produces the plasma light. The more intensive bands are in the UV region.
The reason why only the $2^{nd.}$ positive system can be observed is that due to the very short lifetime of $3.8 \cdot 10^{-8}$ s the $C^3\Pi_u$ state has simply the change to relax radiatively. All other excited states relax by collisions with other molecules, for example to generate oxygen radicals by the reaction
$N_2(B^3\Pi_g) + O_2 \rightarrow N_2(X^1\Sigma^+_g) + 2\ O\cdot$ which is then followed by the ozone reaction $O\cdot + O_2 + M \rightarrow O_3^* + M \rightarrow O_3 + M$.

Keywords
Dielectric barrier discharge
waste gas treatment
optical emission spectroscopy