Study of VOC removal and *E. Coli* sterilization in six-mat space by atmospheric microplasma

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In recent years, the deterioration of IAQ (Indoor Air Quality) became a big concern. Because indoors is the place where we spend most of our life, IAQ is an important factor to be considered for a comfortable and healthy living. For the purpose of improving IAQ, in this study we evaluated deodorization process of formaldehyde, hexadecane and the sterilization of *E. coli* using microplasma electrode to improve IAQ due to the effect of the various active species. Moreover microplasma generates a low concentration of ozone which contributes to IAQ. This study was conducted in closed box with a volume of 23.4m^3.

1. Objectives

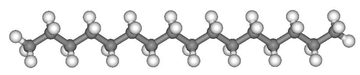
Target 1 ⟶ ***E. Coli*** **(Migula 1895)**

- cause of a infection
- food intoxication

BioCote Antimicrobial Technology

Feasibility study of sterilization of *E. Coli* by atmospheric plasma in large area (23.4m^3)

Target 2 ⟶ **Hexadecane**

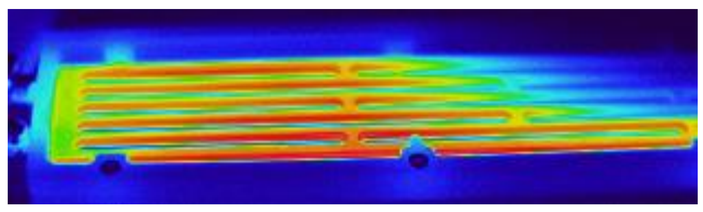


- Cause of odor
- carcinogenic substance
- Contained in PM 2.5

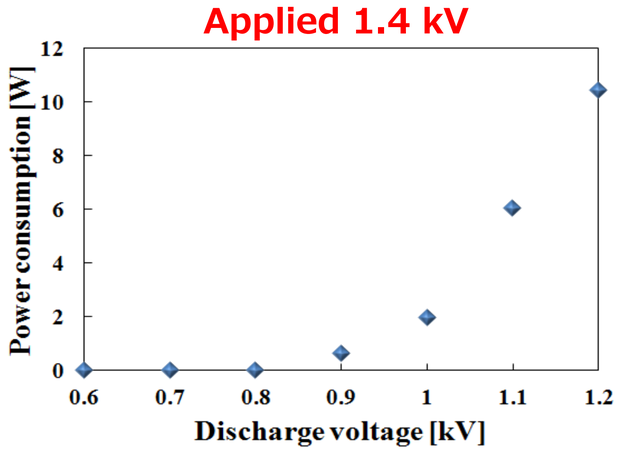
$C_{16}H_{34}$

Remove hexadecane that has a large mass, and confirm what byproducts are obtained during the treatment process.

Schematic of microplasma electrode

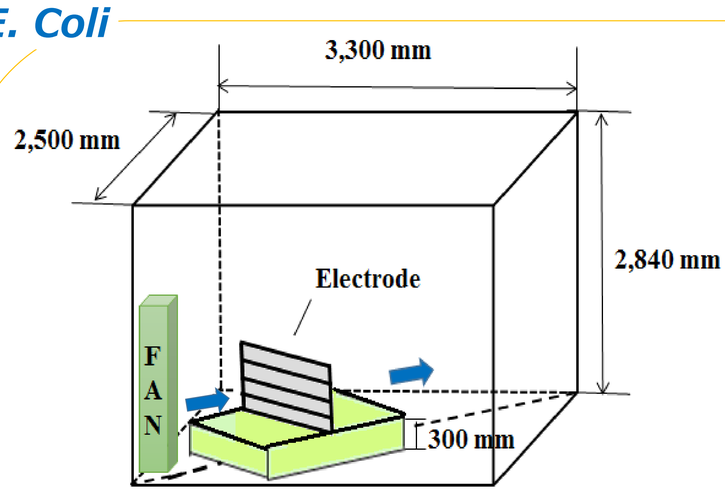


Applied 1.4 kV

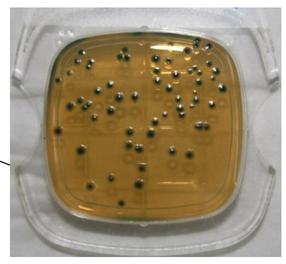


2. Experimental methods

E. Coli



Capacity : 23.4 L

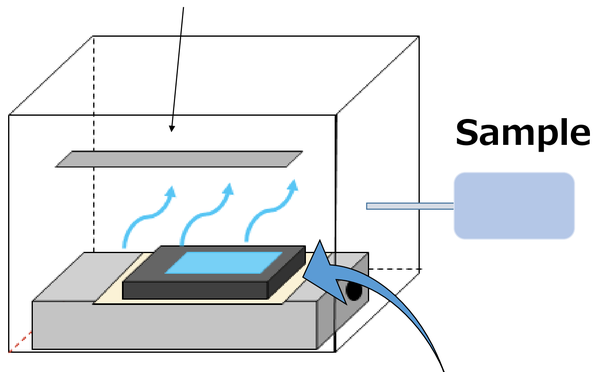


Stamp agar

Experimental condition

Power supply : AC
Flow rate : 4.8 m^3/min
Treatment time : 120 min.

Hexadecane



Capacity : 9L

Hexadecane

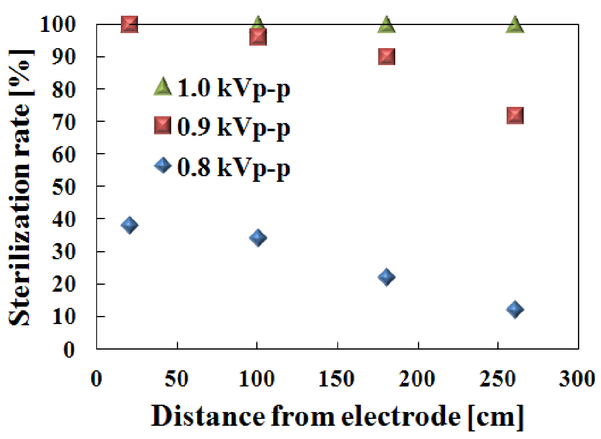
Molar weight 226.44 g/mol
Melt point 18℃
Boiling point 287 ℃
0.5 g

Experimental condition

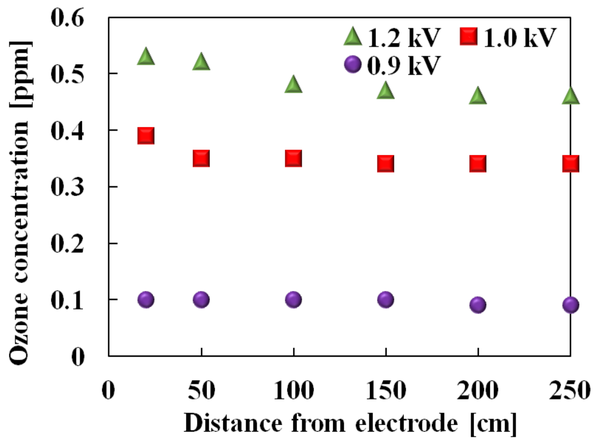
Applied voltage : AC 1.2 kV
Treatment time : 60 min.
Concentration : 0.6 %

3. Results

E. Coli



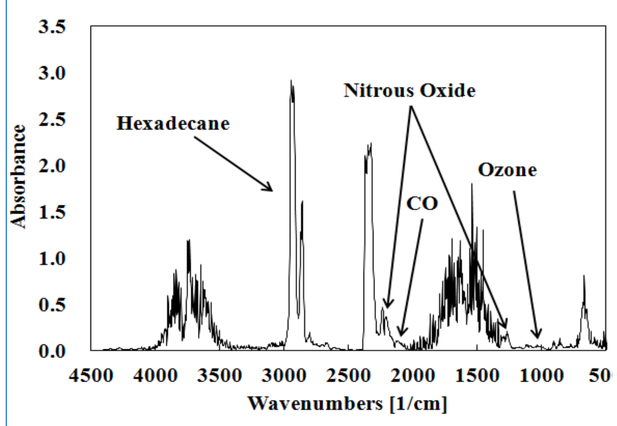
After treatment of 120 minutes

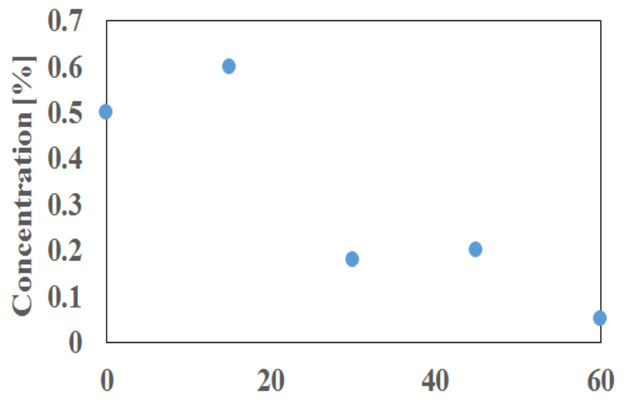


After treatment of 15 minutes

When applied voltage was 1.0 kV, sterilization rate was almost 100 % at each distance. In the case of 0.8 kV, sterilization rate decreased considerably.
Different discharge currents at 0.8 kV and 0.9 kV caused different sterilization values.

Hexadecane





After treatment of 15 minutes

Hexadecane was removed 85 % after 60 minutes of treatment. Nitrous oxide, CO and ozone were the confirmed byproducts using FTIR analysis.

4. Conclusions

- *E. Coli* was sterilized 99 % when applied voltage was 1.0 kV. Microplasma electrode can be applied to serilize *E. Coli* in 6 mats space.
- Hexadecane was removed 85 % in 60 minutes but after decomposition, CO and Ozone resulted as byproducts.