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 23.4m³.

1. Objectives

Target 1 — E. Coli (Migula 1895)
- cause of a infection
- food intoxication

Target 2 — Hexadecane
- Cause of odor
- carcinogenic substance
- Contained in PM 2.5

Feasibility study of sterilization of E. Coli by atmospheric plasma in large area (23.4m³)
Remove hexadecane that has a large mass, and confirm what byproducts are obtained during the treatment process.

2. Experimental methods

E. Coli

Experimental condition
- Power supply: AC
- Flow rate: 4.8 m²/min
- Treatment time: 120 min.

Hexadecane

Experimental condition
- Applied voltage: AC 1.2 kV
- Capacity: 23.4 L
- After treatment of 15 minutes
- After treatment of 120 minutes

Molar weight: 226.44 g/mol
Melt point: 18°C
Boiling point: 287°C

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 sterilize E. Coli in 6 mats space.
- Hexadecane was removed 85% in 60 minutes but after decomposition, CO and Ozone resulted as byproducts.