

Tyvek 紙包装された芽胞菌のプラズマ不活化における紫外線の効果

Effects of UV Emission on Plasma Inactivation of Spore Forming Bacteria Wrapped with Tyvek Sheet

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1. Introduction

Currently, there are many techniques for sterilization of medical instrument, such as, steam autoclave, ethylene oxide gas and gamma irradiation sterilization. However, these methods have their own problems, such as high temperature, toxicity and high cost, respectively. In recent years, the development of plasma sterilization technique has been widely investigated. Plasma sterilization technique has many advantages over traditional methods such as low temperature processing, short treatment time and no toxicity after processing. Task of plasma sterilization is generation of uniform high density plasma in a large volume. So far we have developed a microwave plasma sterilization device with face-type planar microwave launchers to generate high density and large volume plasma. In addition, in the actual sterilization process of the medical instruments, it is necessary to sterilize instrument packaged in sterile packs, such as Tyvek sheet. In this study, we evaluated for inactivation characteristics of spore-forming bacteria wrapped by a Tyvek sheet.

2. Experimental setup

A schematic diagram of the experimental setup is shown in Figure 1. Two microwave magnetrons of 1.5 kW are used to realize a large volume of plasma inside of chamber. With two microwave launchers being equipped face-to-face, we can generate uniform high-density plasma. The 2.45 GHz microwave guided by a rectangular waveguide is transferred to the planar launcher via a coaxial waveguide and plasma is generated by irradiation of microwave from the planar microwave launcher installed in a vacuum chamber. By rotating the stage, we can expect spatially uniform sterilization of the instruments. Sample stage of 190 mm in diameter and 200 mm in height was set on the rotating stage in chamber. Biological indicators (BIs) of *Geobacillus stearothermophilus* spores wrapped with a Tyvek sheet were put on the sample stage.

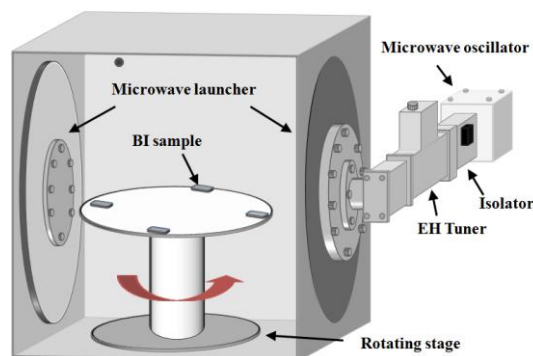


Fig.1 Schematic view of microwave plasma device..

3. Result and Discussion

Figure 2 shows the results of colony count measurements of Tyvek-wrapped spore-forming bacteria treated by nitrogen and oxygen gas mixture plasma at an incident power of 1500W for different treatment times of 10, 20, 40 and 60 min.

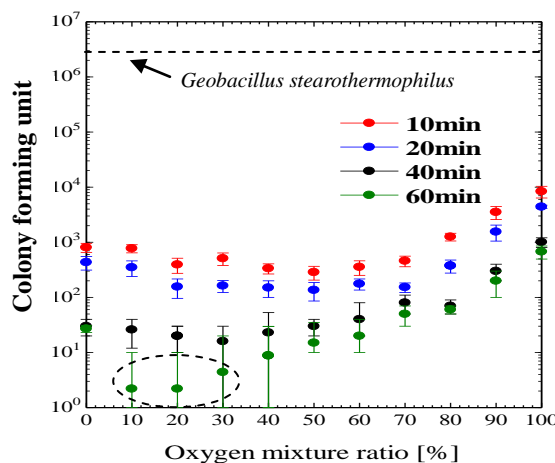


Fig. 2 Survival curves of spores as a function of oxygen mixture ratio for different treatment times.

It was confirmed that a high inactivating effect in 10-30% oxygen mixture ratio. This might be due to the effect of UV radiation of NO or N₂ molecules generated in the plasma. We will discuss the effect of UV emission on inactivation of BIs at the conference.