

深紫外 LED と殺菌

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The bactericidal effect of deep UV light-emitting diodes (*SEIWA ELECTRIC MFG. CO., LTD.*)

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Ultraviolet rays (UVs) are divided into UV-A (400-315 nm), UV-B (315-280 nm), and UV-C (280-100 nm) based on the wavelength. The excellent properties of UV-C, such as water purification and sanitization, have enabled their extensive use in the food and medical fields. Low- or Medium pressure mercury lamps have been commonly used as light sources. On the other hand, UV-C light-emitting diodes (LEDs) have attracted numerous attention in terms of safety in recent years, because they can serve as a mercury-free light source. Unlike mercury lamps, LEDs can illuminate immediately upon starting without warm-up operations, resulting in energy saving. Further, LED modules can be designed intentionally owing to their compactness. As a result, LED-based sterilizing devices enable point-of-use water purification. However, UV-LEDs still suffer from low luminous efficiency and heat generation. Thus, they should be fabricated to provide high heat dissipation efficiency. Hence, Seiwa Electric Mfg. Co. Ltd. developed a flow-through small sterilizing device based on UV-C-LEDs. Importantly, the sanitizing effect of the device is determined by several factors, such as structures or flow rates, and differs depending on the kinds of bacteria samples. To confirm this, we clarified the correlation between UV-irradiation intensity and an inactivating effect on a target bacteria. In addition, we also explored the antibacterial effects of UV-C irradiation power and flow rates on water sanitization through water-flowing tests in practical use. In this presentation, we will provide more detailed results and discussion.

Keywords : *deep UV light-emitting diodes, sanitization, water purification*

紫外線は波長により、UVA(400-315nm)、UVB(315-280nm)、UVC(280-100nm)に分類される。UVC は、水や空気を除菌する機能を有し、医療や食品分野などで幅広く利用されている。光源は、低圧水銀ランプや中圧水銀ランプが主流であるが、近年水銀フリー光源として、深紫外 LED(UVC-LED)が注目されている。UVC-LED は、水銀ランプと比較して、ウォームアップが不要であり、即時使用可能である。また、小型であることから構造の自由度が大きく、除菌したい場所に直接設置可能な Point of Use (POU)にも適している。しかし、その発光効率は低く、発熱の課題があるため、放熱機構は必須である。

星和電機(株)は、流水除菌に着目し、小型リアクターの開発を進めている。流水除菌リアクターの仕様は、その目的により、構造や流量、対象の微生物種が異なる。本発表では、その一例として、回分式試験における、紫外線量と微生物の不活化性能と、実用的な流水試験における、紫外線出力や流量と水除菌性能の関係について報告する。