

The ultraviolet sterilization bands are 254nm, 275nm, 222nm, 405nm

254NM

This band is commonly used in ultraviolet mercury lamps. It uses low-pressure mercury vapor to radiate ultraviolet rays during discharge. Low-pressure mercury vapor mainly produces 254nm and 185nm ultraviolet rays. The characteristic wavelength of the mercury lamp for sterilization is 253.7nm, and its radiation power reaches watts. (W) level, has a wide range of applications in a large space environment, and has a good sterilization effect. In the past, ultraviolet mercury lamps were considered the best choice for disinfection and sterilization, including most germicidal lamps on the market today are still 254nm mercury lamps. However, compared with the ultraviolet LED lamp, the mercury lamp has the disadvantages of large size, high energy consumption, long warm-up time, and mercury content. In the future, deep ultraviolet LED will have a huge application space.

275NM

Deep ultraviolet LEDs are different from mercury lamps. The mainstream products of deep ultraviolet LEDs have characteristic wavelengths of 275-280nm. 253.7nm and 275nm are on both sides of the DNA absorption peak wavelength of 265nm respectively. They have almost the same DNA absorption value, so they have almost the same sterilization efficiency. UV LEDs have the advantages of small size, low power consumption, and instant on and on, etc., which can enclose ultraviolet rays in a small space. The leakage of ultraviolet rays is easy to prevent and control, and it can coexist with humans and machines. It has obvious advantages in practical applications. With the advancement of UV LED technology, UVC LEDs that are smaller, more powerful, non-toxic, longer-lived, more energy-efficient, and allow more switching times have become a new choice for sterilization light sources.

222NM

Researchers have found that ultraviolet rays with a wavelength of 222nm cannot penetrate the stratum corneum of human skin, are harmless to the human body, and have the same sterilization effect as traditional ultraviolet lamps. This is the actual situation. The work is still in the laboratory

紫外線殺菌波段有 254nm、275nm、222nm、405nm

254NM

這個波段常見於紫外線汞燈，它是利用低氣壓的汞蒸氣在放電過程中輻射紫外線，低壓汞蒸氣主要產生 254nm 和 185nm 紫外線，汞燈起殺菌作用的特徵波長是 253.7nm，其輻射功率達到瓦（W）量級，在大空間環境中有大範圍應用，有良好的殺菌效果。紫外線汞燈在過去曾被認為是消毒和滅菌的最佳選擇，包括現在市場上大部分的殺菌燈依舊是 254nm 汞燈。但是汞燈與紫外 LED 燈相比，尺寸大、能耗高、預熱時間長、含汞等弱點，未來深紫外 LED 將有巨大的應用空間。

275NM

深紫外 LED 不同於汞燈，深紫外 LED 的主流產品特徵波長為 275-280nm，253.7nm 和 275nm 分別在 DNA 吸收峰值波長 265nm 兩側，具有幾乎相同的 DNA 吸收值，因此具有幾乎相同的殺菌效率。紫外 LED 因具備小尺寸、低功耗、即點即亮等優點，可將紫外線封閉在小空間中，紫外線洩漏易於防控，可做到人機共存，在實際應用中具備明顯優勢。隨著紫外 LED 技術的進步，更小、更強大、無毒、壽命更長、更節能，並且允許的開關次數更多的 UVC LED 成為殺菌光源的全新選擇。

222NM

研究人員發現，波長 222nm 的紫外線無法穿透人體皮膚角質層，對人體無害，且具有與傳統紫外線燈同等的殺菌效果，而實際的情況是此工作尚處於實驗室研究階段，距離產業化應用還有很長的路要走。

405NM

405nm 的紫光（也可劃入 UVA 範圍）具備一定的殺菌能力，研究人員採用 18150mW 的 405nm 光源在 50cm 距離照射大腸桿菌 9 小時，獲得 99.9% 的殺菌效率。該種方式殺菌效率較低，所需的光源功率高，散熱難，大大限制了其廣泛應用。

紫外線殺菌具有廣譜、高效、環保等優良特點，是最適合日常生活使用的殺菌方式。

research stage, and there is still a long way to go before industrial application.

405NM

The 405nm violet light (which can also be classified into the UVA range) has a certain sterilization ability. The researchers used a 18150mW 405nm light source to irradiate E. coli at a distance of 50cm for 9 hours to obtain a sterilization efficiency of 99.9%. This method has low sterilization efficiency, high light source power required, and difficult heat dissipation, which greatly limits its wide application.