

COMBINED UV PLASMA TREATMENT FOR SURFACE DISINFECTION

Technology

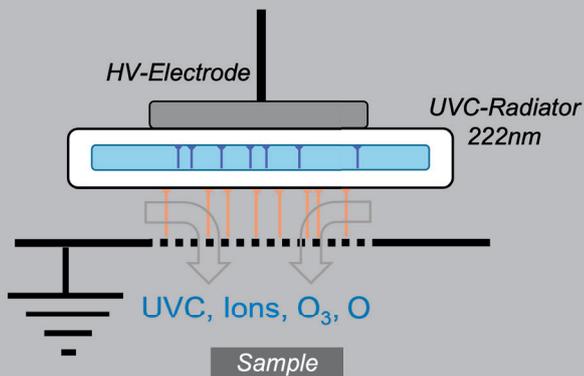
Today, UV radiation and plasmas are used to disinfect or sterilize surfaces. However, both methods have limitations: UV irradiation suffers from losses due to shading on rough surfaces or insufficient effectiveness with certain types of pathogens. In pure plasma treatment, applications are limited by the high energy required for plasma generation and the high irradiances required for surface exposure.

Method

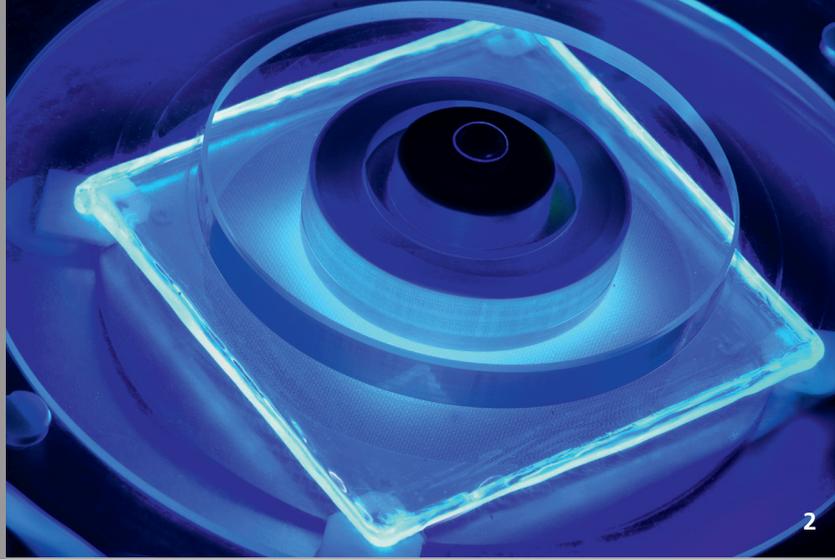
To merge the advantages of both processes in one device, Fraunhofer ILT has set up a demonstrator system for combined UV-plasma treatment. In a cascaded barrier discharge, both UV-C radiation at a wavelength of 222 nm and air plasma are efficiently generated through the application of alternating high voltage. A continuous air flow directs the reactive substances generated in the plasma – such as radicals, ozone, and also atomic oxygen generated by the UV-C radiation, as well as the UV-C radiation itself – through a mesh electrode to the surface to be cleaned. The irradiance is about 0.8 W/cm². The irradiance of the UV-C component on the sample is about 2 mW/cm².

1 Schematic diagram of combined UV plasma treatment.

2 UVC lamp.



1



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In initial irradiation experiments with E.coli and Bacillus subtilis, vital germs could be reduced by up to 5 orders of magnitude with a radiant exposure of about 3 J/cm² or by one order of magnitude to 10 % with a radiant exposure of H₁₀ = 10 mJ/cm² for the UV-C component alone.

The design can be scaled down to smaller modules with a power consumption of a few watts and a small size, making this technology also suitable for mobile applications.

Applications

Possible applications for mobile use are in disinfection systems for clinics and medical facilities. Large-scale applications include the production of aseptic packaging materials and the sterilization of heat-sensitive equipment.

Specifications

UV-C wavelength	222 nm
Irradiance	0.8 W/cm ²
Irradiance for UV-C component on sample	2 mW/cm ²
Radiant exposure for germ reduction to 10 % H ₁₀	3 J/cm ² (10 mJ/cm ² UVC)

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