ATMOSPHERIC PRESSURE NON-THERMAL PLASMAS & THEIR APPLICATIONS FOR SOCIAL BENEFITS

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Atmospheric pressure non-thermal plasma is a new and promising area of plasma science and technology with immense application in Chemistry, Medicine, Aerospace, Environmental Engineering, etc [1]. It also brings to the forefront a number of fundamental issues related to surface functionalisation, catalysis and plasma species interactions with materials as well as living cells.

CSIR-CEERI has been working in this area and very recently developed a mercury-free UV (MFP-UV) lamp technology with a novel structural design and an optimized gas mixture that produces strong spectral bands peaking at wavelengths 253 nm and 172 nm along with a weak band peaking at wavelength 265 nm, which are highly useful for water sterilization. The technology is based on sub-atmospheric pressure non-thermal plasmas [1-4]. This invention alleviates most problems of mercury based lamps by virtue of its unique design and the composition of active discharge elements. As a result it is able to produce the desired VUV/UV wavelengths for the deactivation of bacteria and viruses most efficiently —without the use of mercury.

The developed MFP-UV-lamp (O.D. 18 mm and arc length 195 cm) has been tested for bacteria deactivation efficiency at fixed 120 ml water volume. Properly mixed bacterial suspension in water has been exposed by the MFP-UV-Lamp by inserting it inside water in an equivalent household water container. The numbers of experiments have been performed on five types of bacteria, such as, *E. coli, Shigella Boydii, Vibrio, Coliforms and Fecal Coliforms* for different exposure times and 100% deactivation time with 4 log reduction for these five types of bacteria is 8 sec, 4 sec, 6 sec, 8 sec, 6 sec, respectively. Its performance has been compared with the standard commerical mercury based UV-lamp (8"/11W) for *E.coli* bacteria deactivation at the same fixed 120 ml water volume. This could result only 99. 93 % bacteria reduction in 120 sec for *E.coli* bacteria. The developed MFP-UV-Lamp has been further tested for turbidity level up to 20 NTU (Nephelometric Turbidity Units) by mixing Kaoline powder in the water and again its on-time efficiency is ~200 % as compared to standard commerical mercury based UV-lamp. The developed technology has been transferred to two industries for its mass production, especially for house-hold water purifier systems. A few more efforts have been made where cold atmopsheric pressure non-thermal plasma jets, UV-B and UV-A light sources have been built for different social benifits. The results of these efforts will be presented.

References

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