

6th international conference on plasma medicine

Bratislava, Slovakia
September 4–9, 2016

icpm⁶

BOOK OF ABSTRACTS



Edited by Karol HENSEL, Barbora TARABOVÁ, Katarína KUČEROVÁ,
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icpm⁶

Title: 6th International Conference on Plasma Medicine (ICPM-6)

Subtitle: Book of Abstracts

Editors: K. Hensel, B. Tarabová, K. Kučerová, Z. Kovaľová, M. Janda, and Z. Machala

Cover design: L. Jeuffrault

Publisher: KEC FMFI UK, Bratislava

Printing: Neumahr s.r.o., Bratislava, 2016

ISBN 978-80-8147-066-0

Cold air plasma source for biomedical applications based on DC corona discharge

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Cold plasma of DC corona discharges generated in air with or without water electrospray have been demonstrated to successfully decontaminate surfaces with biofilms [1,2] or bacteria in water [3,4]. Since DC corona is a very low-current plasma discharge generating locally high concentrations of reactive species, we developed a cold air plasma source based on positive DC corona for biomedical applications. In addition to the direct plasma effect, the corona ionic wind caused by the drag of neutral air molecules by the drifting ions in the electric field enhances the mass transfer of reactive species onto the target even without the imposed gas flow, which is typical of rare gas plasma jets.

Our portable cold plasma source “corona pen” based on positive streamer corona operates in ambient air and uses a home-made light-weight high voltage transformer, ballast resistors limiting the current to max. $\sim 100 \mu\text{A}$, and the needle electrode in a dielectric tube to generate the corona discharge. We optimized the geometrical and electrical parameters of the plasma source and tested it for decontamination of agar plates or stainless-steel medical scalpels contaminated with Gram-negative *E. coli*, *P. aeruginosa* and Gram-positive *S. aureus*. The corona pen can be applied to human skin for up to 1 min exposure time without inducing pain or other adverse effects and so represents a potential for skin decontamination, wound healing or other biomedical applications requiring a local treatment.

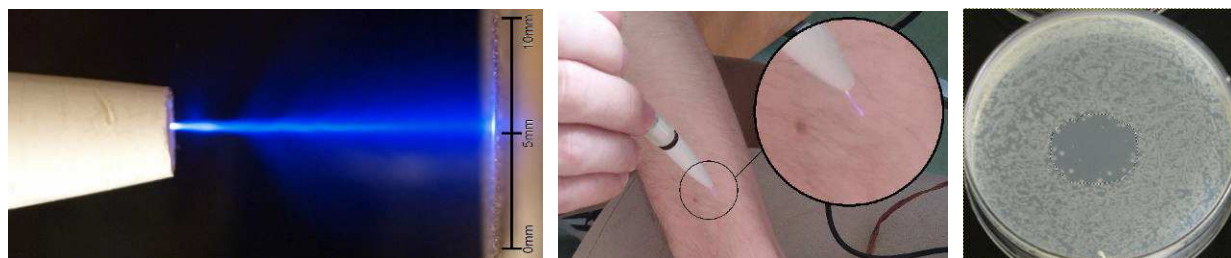


Fig. 1 From left: Positive corona discharge in ambient air issuing from the dielectric tube; application of the “corona pen” on human skin; decontaminated area on the agar plate covered with *E. coli* ($\sim 10^5$ CFU) after 1 min exposure to the “corona pen”.

This work was supported by Slovak Research and Development Agency APVV-0134-12.

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