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Plasma Sources for Medical Applications - A Comparison of Spot Like Plasmas and Large Area Plasmas
KLAUS-DIETER WELTMANN, INP Greifswald

Plasma applications in life science are currently emerging worldwide. Whereas today's commercially available plasma surgical technologies such as argon plasma coagulation (APC) or ablation are mainly based on lethal plasma effects on living systems, the newly emerging therapeutic applications will be based on selective, at least partially non-lethal, possibly stimulating plasma effects on living cells and tissue. Promising results could be obtained by different research groups worldwide revealing a huge potential for the application of low temperature atmospheric pressure plasma in fields such as tissue engineering, healing of chronic wounds, treatment of skin diseases, tumor treatment based on specific induction of apoptotic processes, inhibition of biofilm formation and direct action on biofilms or treatment of dental diseases. The development of suitable and reliable plasma sources for the different therapies requires an in-depth knowledge of their physics, chemistry and parameters. Therefore much basic research still needs to be conducted to minimize risk and to provide a scientific fundament for new plasma-based medical therapies. It is essential to perform a comprehensive assessment of physical and biological experiments to clarify minimum standards for plasma sources for applications in life science and for comparison of different sources. One result is the DIN-SPEC 91315, which is now open for further improvements. This contribution intends to give an overview on the status of commercial cold plasma sources as well as cold plasma sources still under development for medical use. It will discuss needs, prospects and approaches for the characterization of plasmas from different points of view. Regarding the manageability in everyday medical life, atmospheric pressure plasma jets (APPJ) and dielectric barrier discharges (DBD) are of special interest. A comprehensive risk-benefit assessment including the state of the art of commercial sources for medical use will be discussed.