

kinpen MED: a plasma source for clinical trials

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Atmospheric pressure plasmas are very promising tools for biomedical applications and are expected to bring new therapeutic options in surgery, dentistry and dermatology [1]. Currently, many scientific activities are related to basic research to study plasma-cell interaction or to explore the application spectrum in different fields of medicine. Meanwhile, a series of clinical trials have started to show efficacy and safety, but only few atmospheric pressure plasma sources are available as approved medical device.

Within the joint research project "Campus PlasmaMed II" the device "kinpen 09" is widely used as standard plasma source for research on biomedical applications. Very promising pre-clinical results have shown advantages of plasma based therapies in skin disease treatment [2, 3, 4]. The next step towards an accepted therapy and a medical device is a clinical trial. A device to be permitted for clinical trials has to fulfill specific technical requirements. Therefore the "kinpen 09" plasma source has been redesigned and the new type "kinpen MED" was constructed. Basic plasma properties were kept whereas special attention has been paid to safe and easy operation. The device was successfully tested (IEC 60601-1 and EN 60601-1-2) and approved for clinical trials.

In this contribution the "kinpen MED" and its basic characterization concerning gas temperature, ultraviolet irradiance and ozone concentration, obtained in three different measurement conditions, will be discussed. Furthermore specific aspects related to the development of a plasma source as medical device are given. Currently, the "kinpen MED" is used in a clinical trial at "Charité" for ulcer therapy. First results of this study will be presented.

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References

- [1] Fridman G., Friedman G., Gutsol A., Shekhter A.B., Vasilets V.N., Fridman A., *Plasma Processes Polym.* (2008), **5**, 503-533
- [2] Lademann J., Richter H., Alborova A., Humme D., Patzelt A., Kramer A., Weltmann K.-D., Hartmann B., Ottomann C., Fluhr J., Hinz P., Hübner G., Lademann O., *J. Biomed. Opt.* (2009), **14**, 054025
- [3] Lademann O., Richter H., Patzelt A., Alborova A., Humme, D., Weltmann K.-D., Hartmann B., Hinz P., Kramer A., Koch S., *Laser Phys. Lett.* (2010), **7**, 458-462
- [4] Daeschlein G., von Woedtke T., Kindel E., Brandenburg R., Weltmann K.-D., Jünger M., *Plasma Processes Polym.* (2010), **7**, 224-230