
# LANGMUIR PROBE SYSTEM - Atmospheric Pressure Plasma

Measure the fundamental plasma parameters with the industry standard Langmuir Probe

https://www.impedans.com/langmuir-probe

Impedans
PLASMA MEASUREMENT

# Low Temperature Plasma (LTP) in clinical therapy

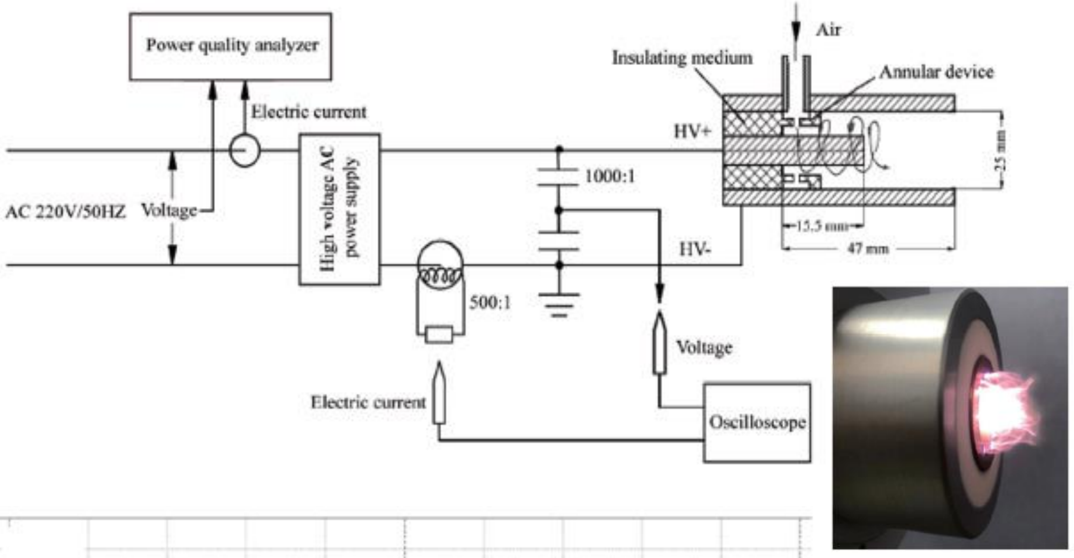
**A novel atmospheric-pressure air plasma jet for wound healing**

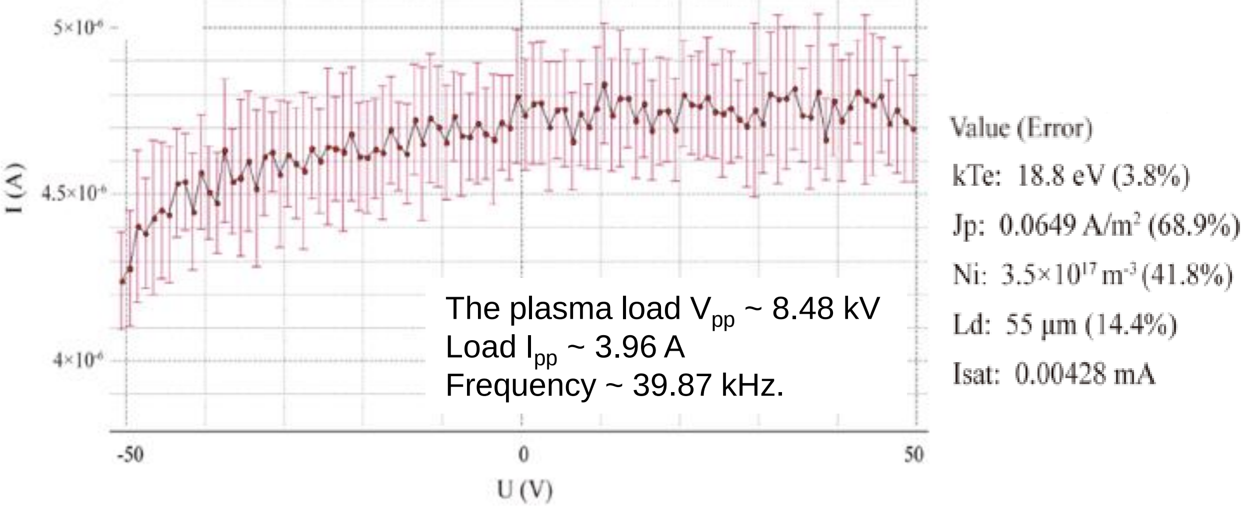
DOI: https://onlinelibrary.wiley.com/doi/abs/10.1111/iwj.13652

In the present study, a novel type of LTP device driven by High-voltage AC was developed which had a free gas source (air), a long working distance (8 cm), high gas flow rate (10 $m^3$/h), and a large effective treatment area (20 $cm^2$), effectively addressing the shortcomings of current LTP devices. Furthermore, it was verified that the new LTP equipment provides accelerated wound healing in normal and Type I diabetic rats.

The temperature of the plasma jet at the nozzle of the plasma generator ~100 C
The plasma temperature at a distance of 8 cm from the nozzle ~ 43 C

Some example data is shown to the right




The plasma load $V_{pp}$ ~ 8.48 kV
Load $I_{pp}$ ~ 3.96 A
Frequency ~ 39.87 kHz.

*Schematic of the novel LTP device and parameters* of the plasma measured by the Langmuir probe detection system in real-time.

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# Charging mechanisms of particles in an Atmospheric pressure LTP afterglow

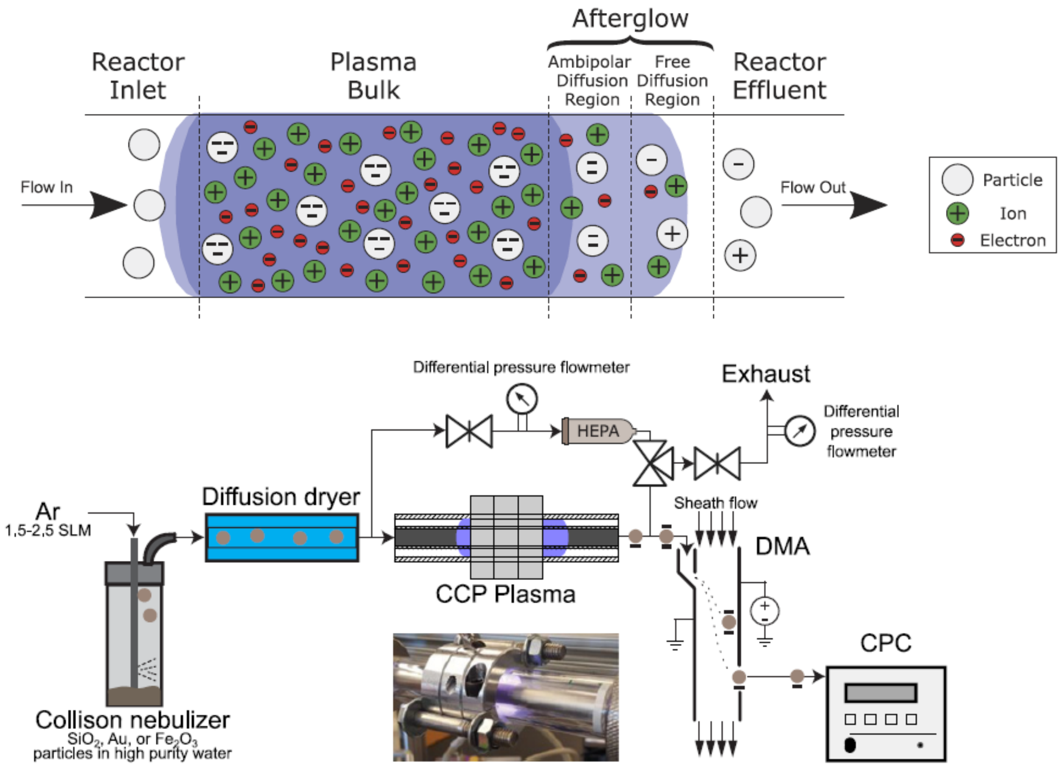
**Particle charge distributions in the effluent of a flow-through atmospheric pressure low temperature plasma**

DOI: [https://doi.org/10.1088/1361-6595/ac12c1](https://doi.org/10.1088/1361-6595/ac12c1)

In the present study, it is demonstrated that particles could become negatively, neutrally, or even positively charged in an Atmospheric Pressure - LTP afterglow. Particles in the plasma bulk are highly negatively charged. Results shows that in the spatial afterglow, particles will begin to lose negative charges and can become negatively, neutrally, or even positively charged as particles transfer from the ambipolar diffusion to the free diffusion region.

An Impedans RF-compensated double Langmuir probe was utilized for plasma characterization.

Some example data is shown to the right




*Schematic of atmospheric pressure RF flow-through plasma with a coaxial electrode configuration.*

**Table 1.** Plasma parameters, $T_e$, the electron temperature, $n_{ion}$, the ion density, $P$, pressure, and $T_B$, the bulk temperature in the plasma.

| $T_e$(eV) | $n_{ion}$(#m$^{-3}$) | $P$(Torr) | $T_B$(K) |
|---|---|---|---|
| 4 | $10^{18}$ | 745 | 600 |

# Measurement of plasma parameters in micro-discharges with a hollow cathode at atmospheric pressure in helium

**Diagnostics and comparative analyzes of plasma parameters in micro hollow cathode discharges with an open and covered external surface of cathode in helium using an additional electrode**

DOI: [https://doi.org/10.1088/1361-6595/abd61d](https://doi.org/10.1088/1361-6595/abd61d)

In this work, diagnostics and comparative analysis of micro-hollow cathode (MHC) discharges with an open and covered external surface of the cathode in helium at atmospheric pressure were carried out.
The discharge was initiated using a DC power supply unit of 750 W and variable voltage (maximum amplitude of 1500 V).
It is shown that by covering the external surface of the cathode, it is possible to achieve the effect when the current–voltage characteristics of the discharge grows in a wider range of discharge currents.

Some example data is shown to the right

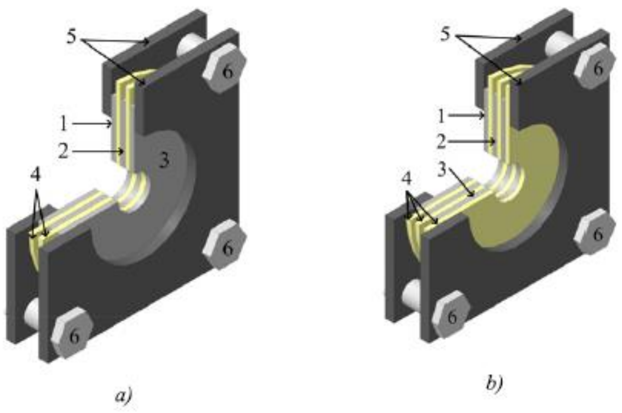
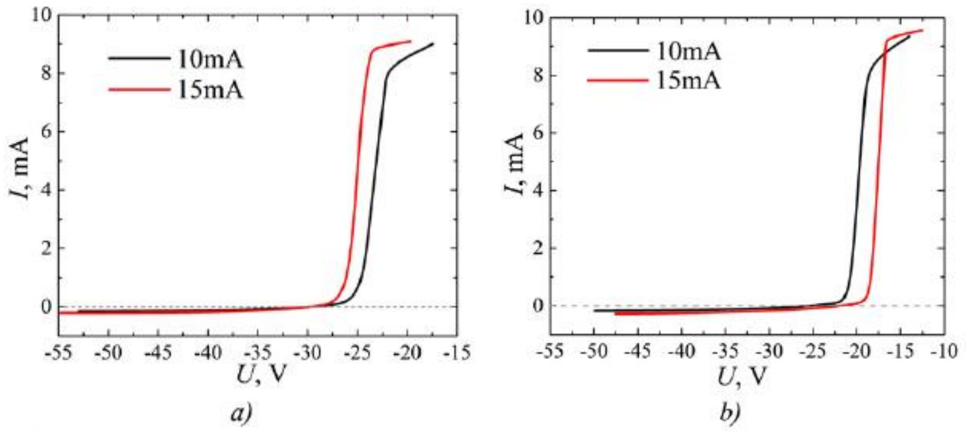
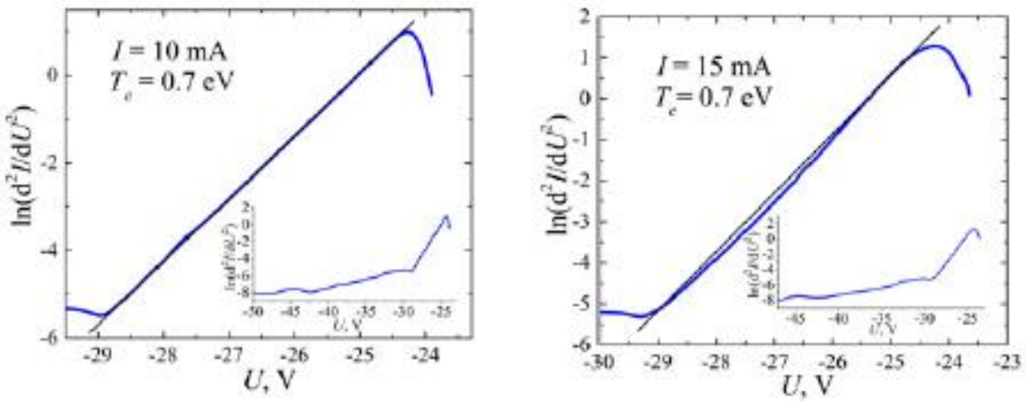



*Diagram of MHC atmospheric discharge (Helium) with (a) open and (b) covered external surface of cathode. 1- Anode, 2- probe, 3- cathode, 4- ceramic insulation, 5- dielectric holder, 6-screws.*



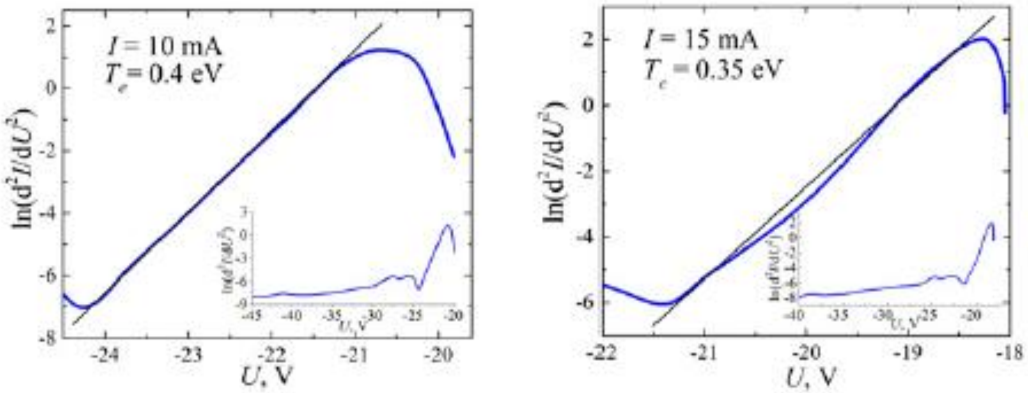

*I–U characteristics of the additional measuring electrode for (a) MHC1 and (b) MHC2 at different values of the discharge current.*

## MHC1



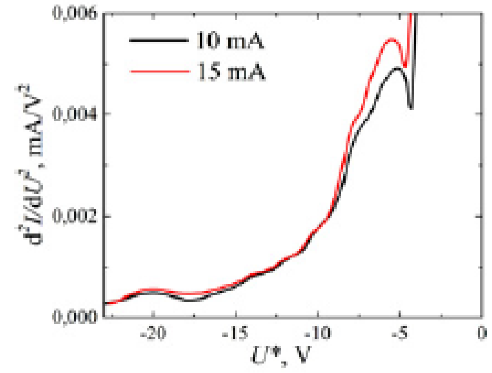

a) b)

## MHC2

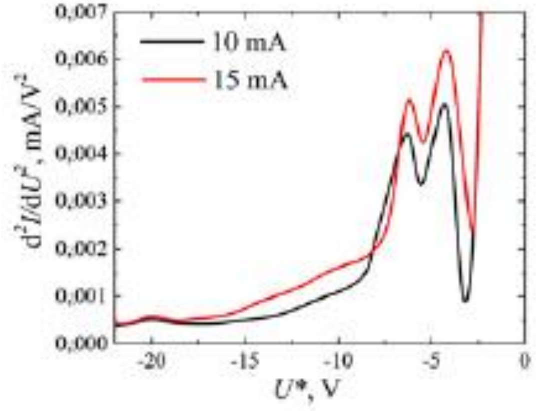



c) d)

The logarithm of the second derivatives of the probe current on the applied additional electrode potential for (a) MHC1 for 10 mA, and (b) MHC1 for 15 mA, (c) MHC2 for 10 mA, and (d) MHC2 for 15 mA.




a)




b)

The second derivative of the additional electrode current with respect to the potential for (a) MHC1 and (b) MHC2 for different discharge currents.

*For atmospheric pressure discharge:*

$T_e$ ~ 0.3–0.4 eV.

$n_e$ ~ 1 × $10^{20}$ $m^{-3}$ to 4 × $10^{20}$ $m^{-3}$

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