

Design and performance of solid-state microwave plasma sources for lab and industrial applications

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Microwaves (MW) are frequently used to produce high density plasmas for industrial and laboratory applications presenting several advantages when compared to RF and DC discharges such as high reactive species density and no need for electrodes. Technological advances over the last few years calls for large-scale processing with high density and uniform plasma at reduced pressure. To meet these industrial requirements **Aura-Wave** [1], an electron cyclotron resonance coaxial plasma source and **Hi-Wave**, a collisional plasma source, have been designed. Multiple sources can be distributed together in the same reactor. Using the solid-state technology allows the sources to be self-adapted [2] on a wide range of operating conditions: gas type, pressure, MW power.

Atmospheric plasma sources are widely requested in applications such as surface functionalization, elementary analysis, creation of radicals and reactive species as well as a broad use in medicine (sterilization/disinfection, treatment of chronic wounds, etc.). For these purposes, a compact plasma source **S-Wave** has been developed. It can operate in the range of a few 10^{-2} mbar to atmospheric pressure and is able to create and maintain plasma columns with variable lengths. An ignition system based on dielectric barrier discharge allows to breakdown easily even at atmospheric pressure.

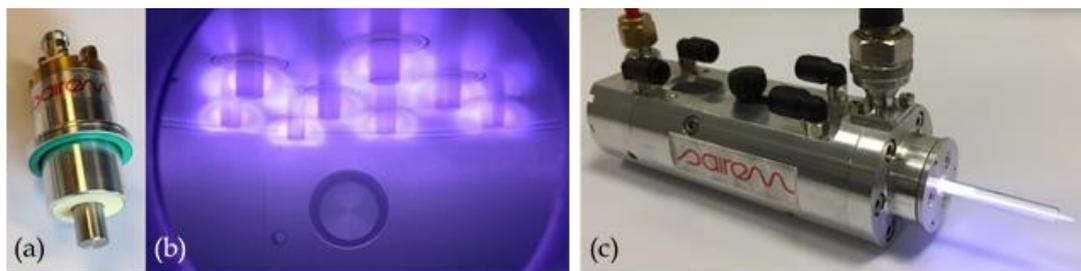


Fig. 1. (a) Aura-Wave ECR MW plasma source; (b) Multisource reactor with 8 off \times Aura-Waves. Argon, total MW power 160 W, 1 Pa. (c) Photo of the atmospheric plasma created by S-Wave (without incorporated ignition system). Argon, MW power 200 W.

References

1. S. Béchu, S., Bès, A., Lacoste, A., Pelletier, J, *Device and method for producing and/or confining a plasma*, Patent WO 2010049456.
2. Latrasse, L., Radoiu, M., Jacomino, J.-M., Grandemenge, A., *Facility for microwave treatment of a load*, Patent WO 2012146870.