

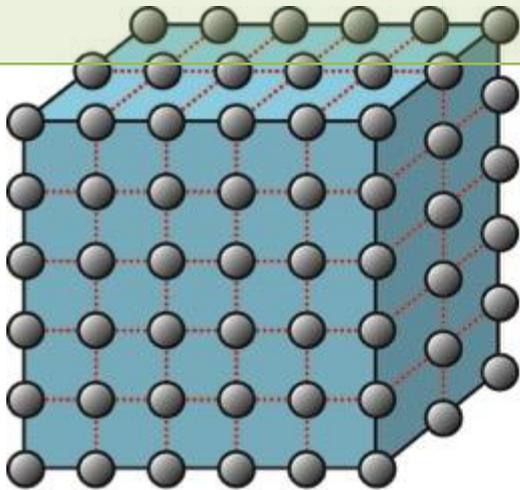
# ***IPLASM***

The innovative surface treatment  
technology for improving printability  
on sensitive and heat sensitive  
materials

# WHAT IS PLASMA?

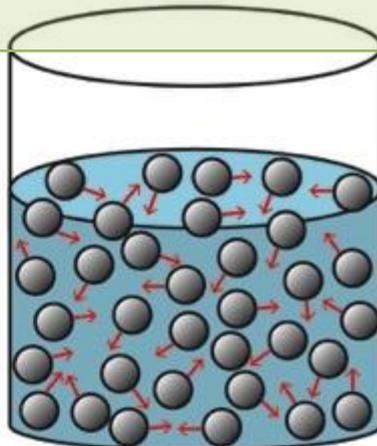
## Solid

- Atoms have a fixed position
- There is a chemical bond between atoms



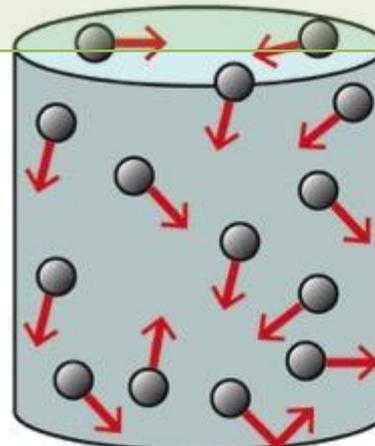
## Liquid

- Atoms or molecules move around
- There is a small attraction force between atoms or molecules



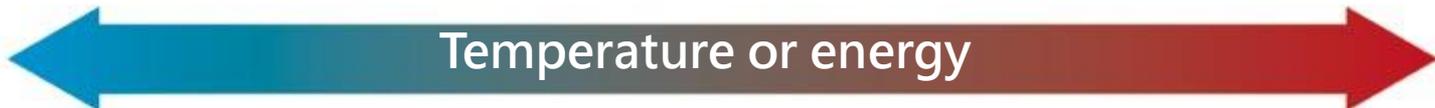
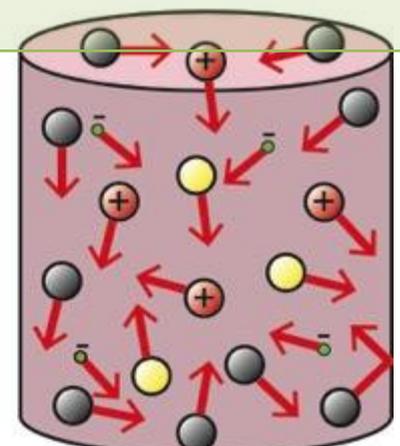
## Gas

- Atoms or molecules move around and collide
- There is no attraction force between atoms or molecules



## Plasma

- Gas that contains free ions and free electrons
- **Gas is partially ionized**



# PLASMA GENERATION

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A plasma is created by **applying energy** to a gas

This energy can be:

**thermal**, or carried by an **electric** current or **electromagnetic** radiations.

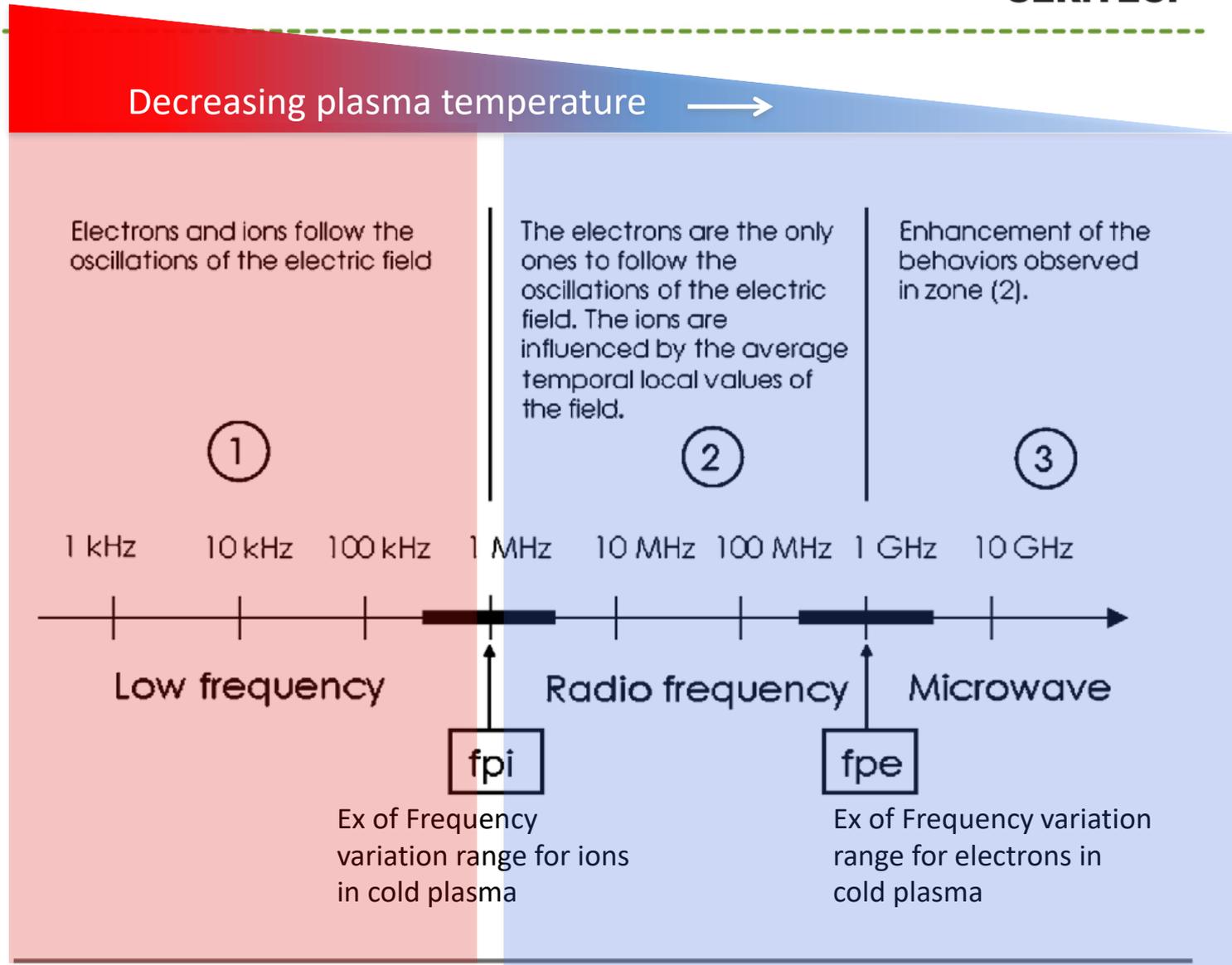
The electric field transmits **energy to the gas electrons**  
(which are the most mobile charged species).

This electronic energy is then transmitted **to the neutral species by collisions**

# PLASMA GENERATION

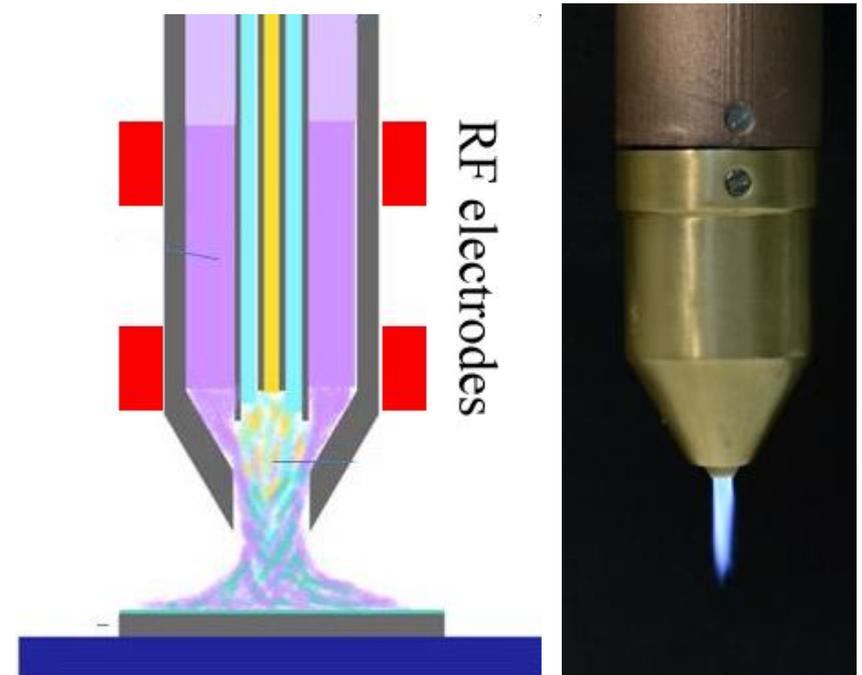
Plasma can be ignited by :  
**DC voltage**  
Or  
**AC voltage**  
at a certain frequency

The **excitation frequency** is important, it influences the behavior of the electrons and the ions;



Iplasm is an **atmospheric pressure plasma jet device** that allows the ionisation of a **Noble gas** (Argon) by applying an **high voltage (HV)** nearby the channel where the gas is flowing.

In order to ensure a cold and efficient plasma, the device is also equipped with a **Radio Frequency (27MHz RF) power supply** system that allows the sustain of the plasma in a cold and homogenous way ensuring a **rich plasma of active species**: free ions, radicals and electrons



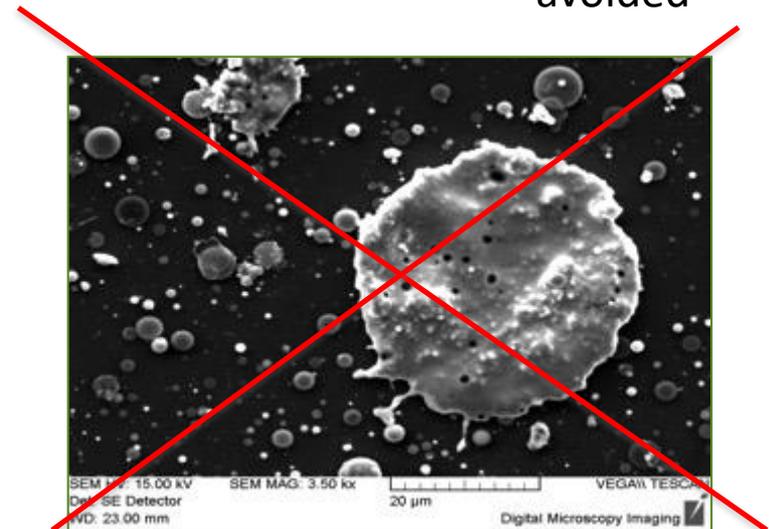
# IPlasm – Main Features

## ✓ Double Dielectric Barrier Discharge design

- ✧ Avoids streamers to arc transition
- ✧ Avoids the contact between the plasma and the electrodes
- ✧ Avoids the problem of the electrodes erosion
- ✧ Ensures a clean plasma

CLEAN

Common problem of arc discharge torches is here avoided



# IPlasm – Main Features

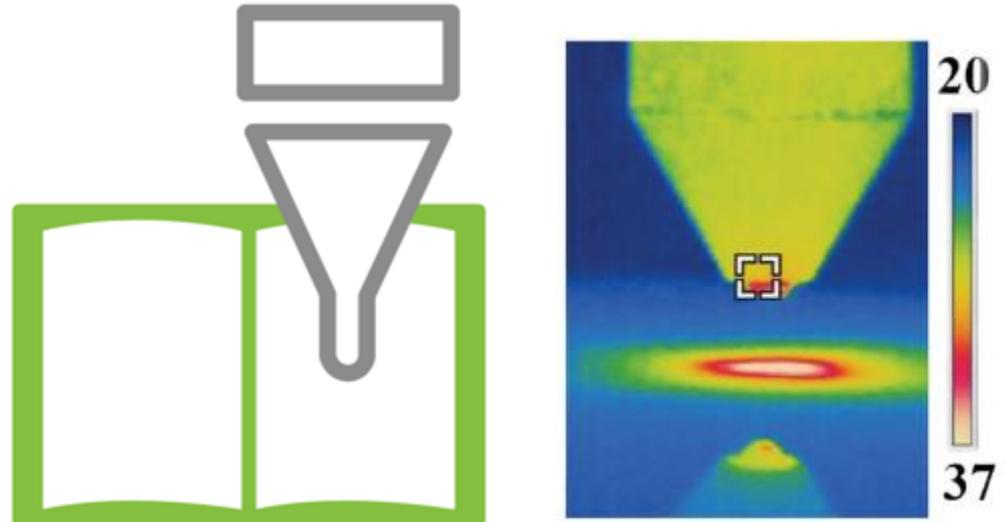
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- ✓ It combines a HV-LF power supply (20W) with a 27MHz RF power supply (20-80W)
  - ✧ Ensures a low temperature plasma
  - ✧ Ensures low current carrying streamers
  - ✧ Ensure high energy transfer to electrons
  - ✧ Ensure high efficiency plasma treatments

COLD

SURFACE TREATMENT < 40° C

The low temperature allows to not heat the treated surfaces and therefore to not damage or induce surface expansion or phase changes



# Iplasm – Main Features

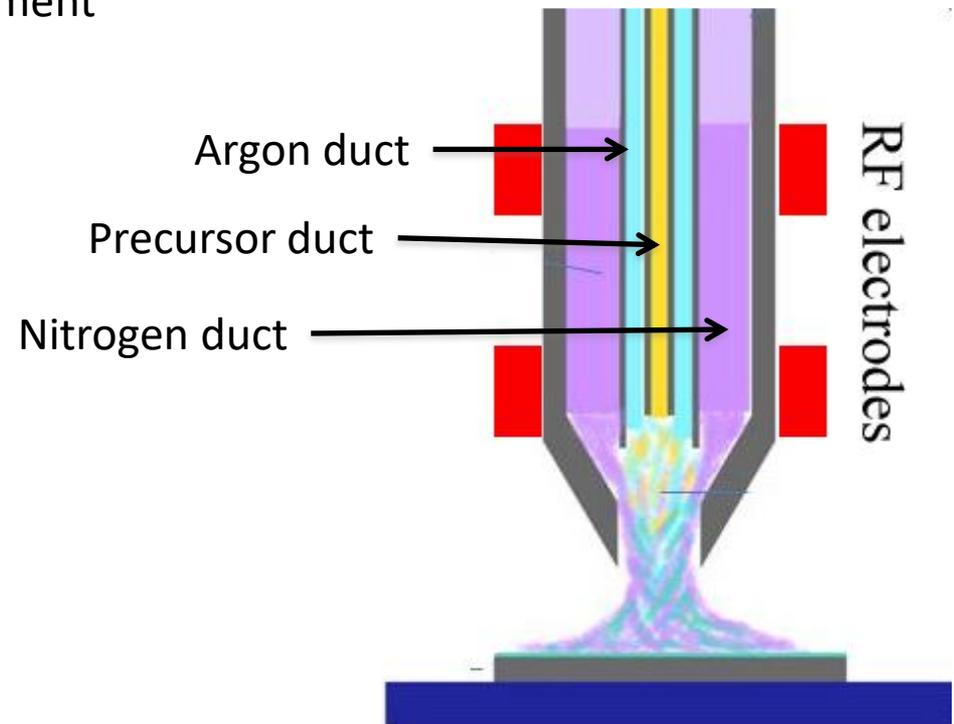
## ✓ Multiple coaxial design for

- ✧ Working gas
- ✧ Chemical precursors introduction (vapours or aerosols)
- ✧ Environmental atmosphere confinement

EFFICIENT



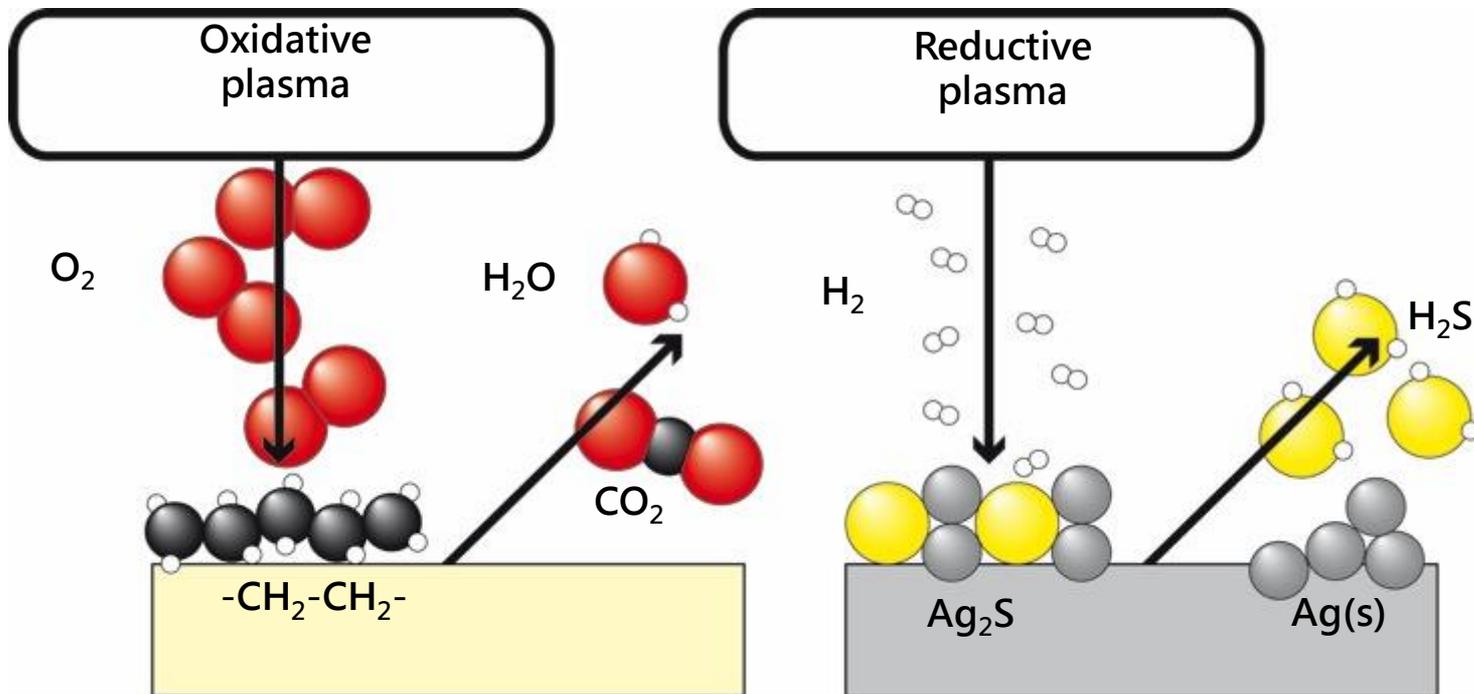
SURFACE CHEMICAL  
FUNCTIONALISATION  
AND  
COATING DEPOSITION



# IPlasm – Designed for CH

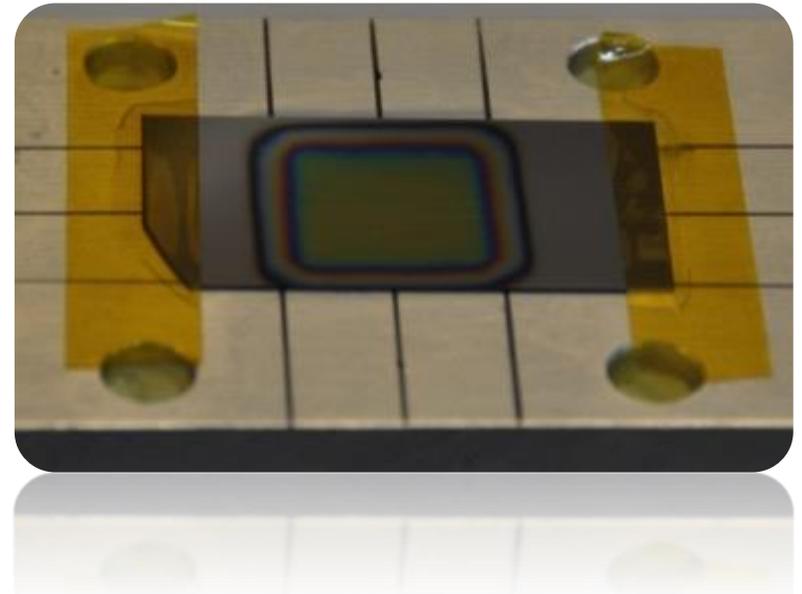
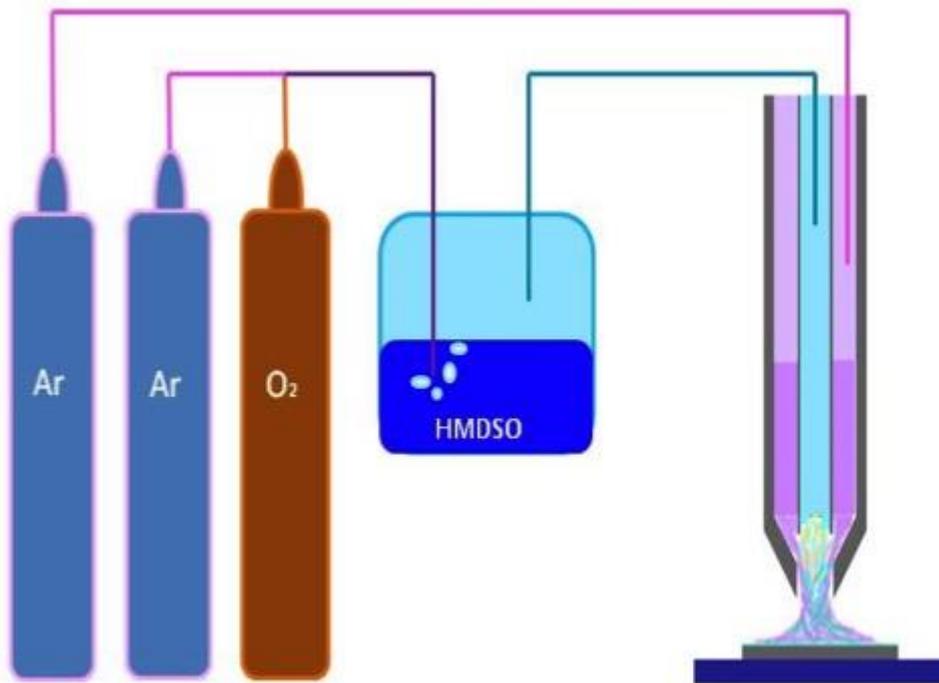
It allows to work with different Argon gas mixtures:

- Ar/O<sub>2</sub> is typically used for cleaning of polymeric substrates and for removal of unwanted organic layers
- Ar/H<sub>2</sub> is typically used for cleaning of oxidised layers from metals



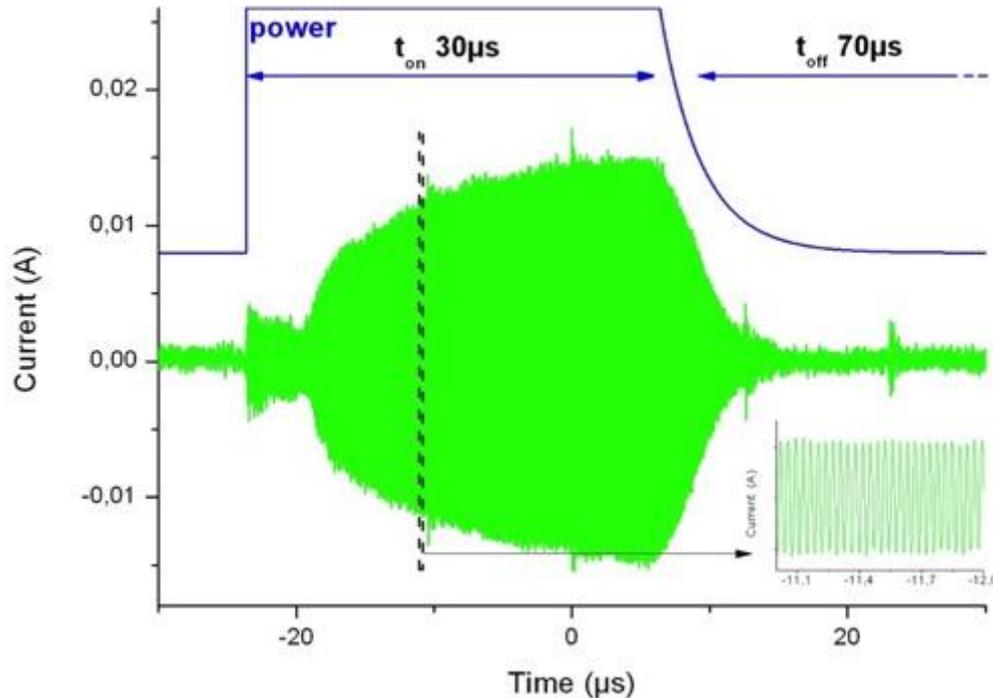
# IPlasm – Designed for CH

It allows the deposition of functional or protective layers by working with the appropriate chemical precursor



# IPlasm – How it works

## ✓ Pulsing System



Allows to further reduce temperature treatment and to better control the plasma chemistry of delicate chemical precursor

# IPlasm – Specifications



## Dimensions

Control Unit	3U dimension rack or trolley
Plasma nozzle	cylinder 20 cm long, 250 g
Connection cables	2 m

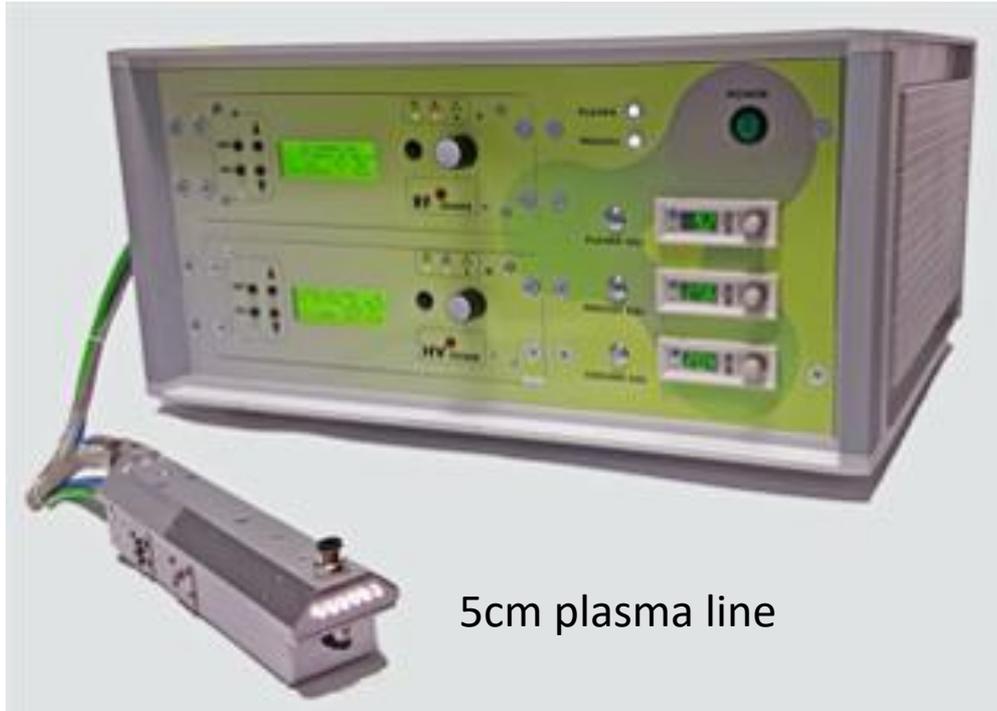
## Supply

Power	10-100W, 220V
Gas 1	Ar 5-10 slm
Gas 2	carrier gas for chemical precursor vapour or reactive gas (0,2-5 slm)
Gas 3	Cooling/Shielding (Air or N <sub>2</sub> 10-20 slm)

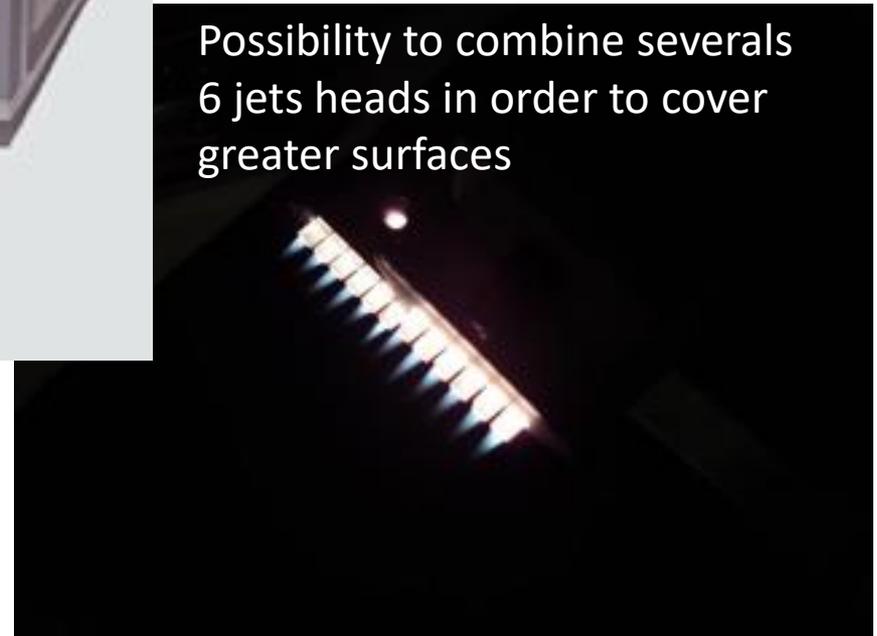
## Treatment

Spot size	1 cm <sup>2</sup>
Surface activation rate	1 – 10 s/cm
Deposition rate (cm <sup>2</sup> )	0,5 – 10 nm/s cm
Pulsing system	t <sub>ON</sub> (30 – 10.000 μs) t <sub>OFF</sub> (50 – 10.000 μs)

# IPlasm 6Jet – Specifications



Possibility to combine several  
6 jets heads in order to cover  
greater surfaces

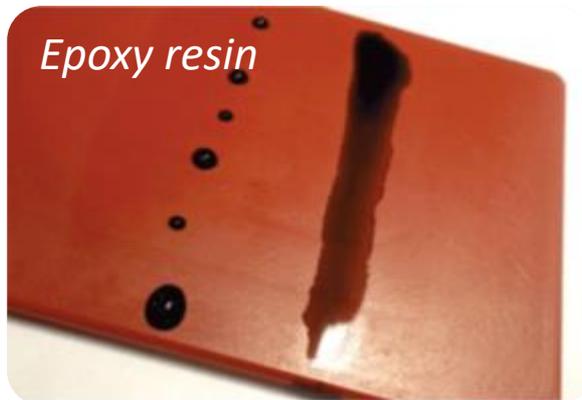


# IPlasm Automation – Specifications

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Possibility to mount IPlasm on a table top robot for automatic pre-treatment



## Surface activation and cleaning

*(before coating application)*

## Improved wettability and overprint ability

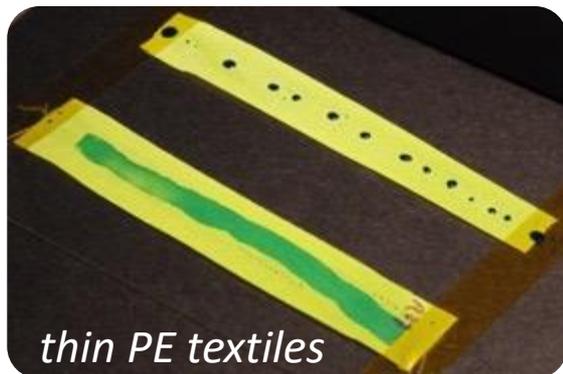
*(of varnishes, inks,...)*

## Adhesion promotion and primer replacement

*(gluing processes, rubber injection, VOC free paint, encapsulating resins,...)*

## Surface protection

*(water repellent and anti-corrosion coatings)*



# IPlasm – Applications

## Creative Industries

Surface treatment  
for  
adhesion improvement  
of decorative printings  
and coatings



# IPlasm – Applications

IPlasm is a powerful tool for adhesion promotion and **for joining dissimilar materials.**

advanced surface modifications are achievable by grafting chemical species and functionalities for adhesion promotion with the desired joint.



*Textile membrane on rubber*



*Adhesive rupture for not treated samples*



*Cohesive rupture for treated samples*

allow the replacement of common solvent-based primers, guaranteeing the desired adhesion performance with environmentally friendly and solvent-free processes.

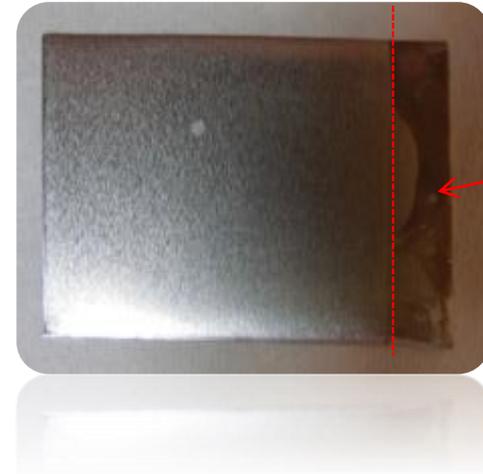
# IPlasm – Other Applications

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## Protective and anticorrosion Coatings

### Surface treatment of technical textiles

*Sails bonding, flame retardants, ...*



Not coated  
part

## Improved composite materials properties

*(also in collaboration with an italian player of composite materials)*

### Enhanced adhesion and joining between composite materials and metals

*(such as aluminum vs carbon fiber, ...)*



High efficiency at Low temperature!

