

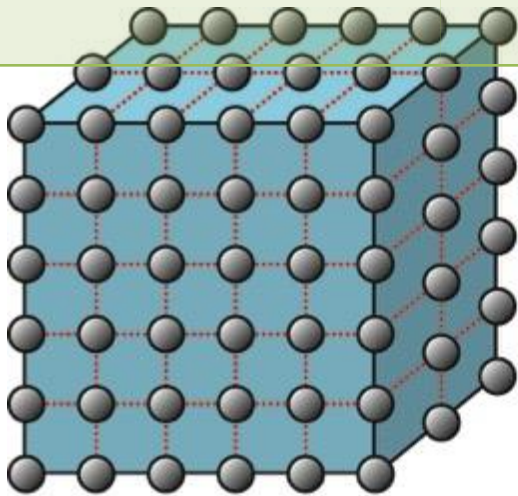
IPLASM

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

WHAT IS PLASMA?

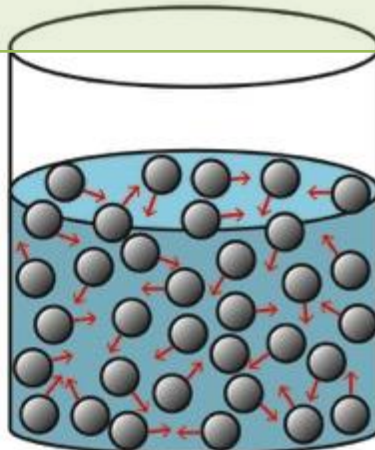
Solid

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



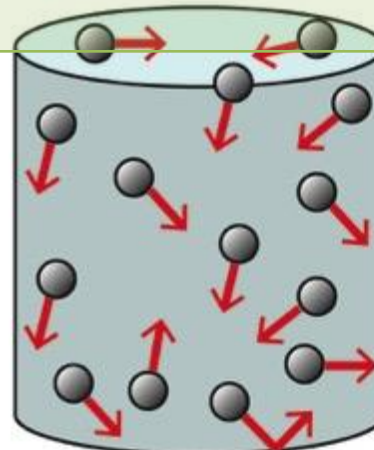
Liquid

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



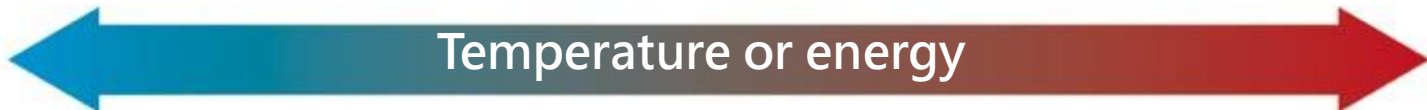
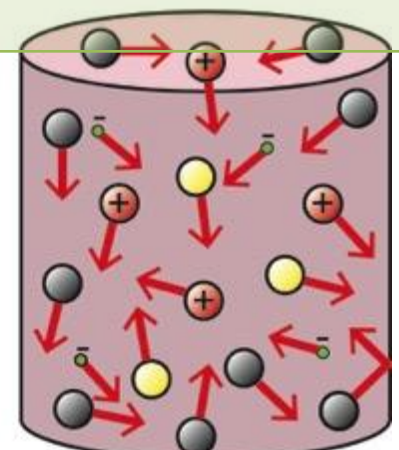
Gas

- 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



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

This energy can be:

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

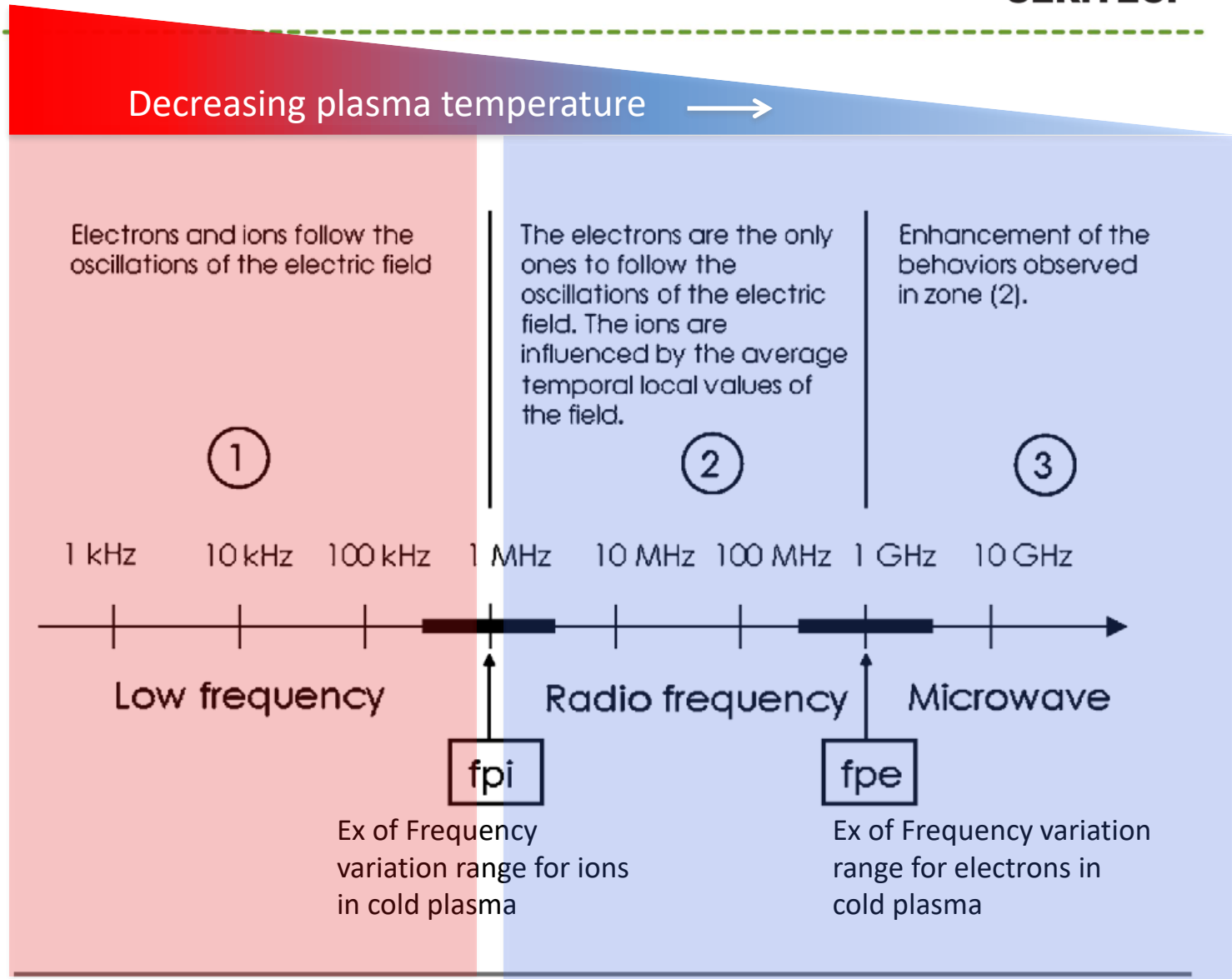
The electric field transmits **energy to the gas electrons**
(which are the most mobile charged species).

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

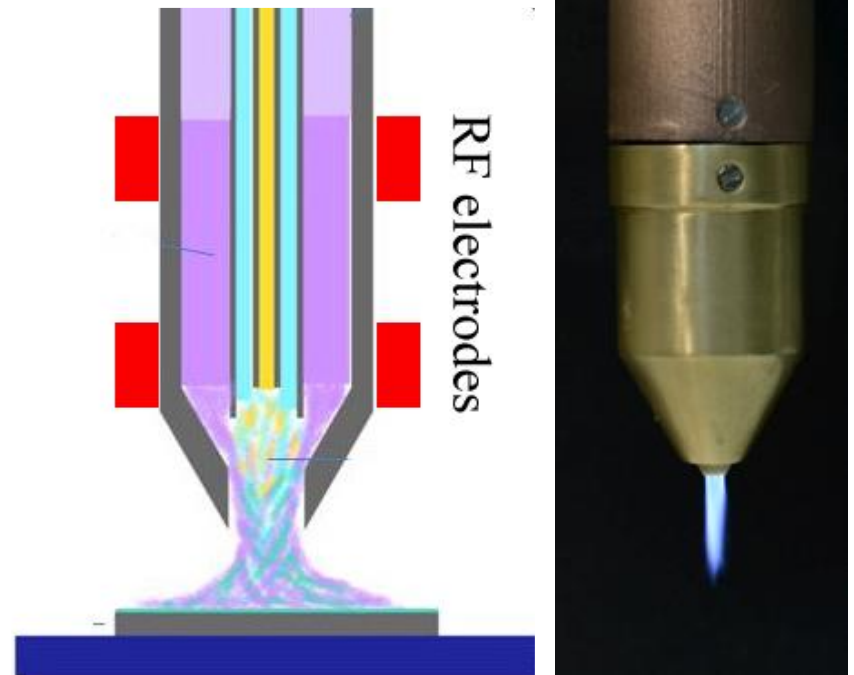
The **excitation frequency** is important, it influences the behavior of the electrons and the ions;



IPLASM

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



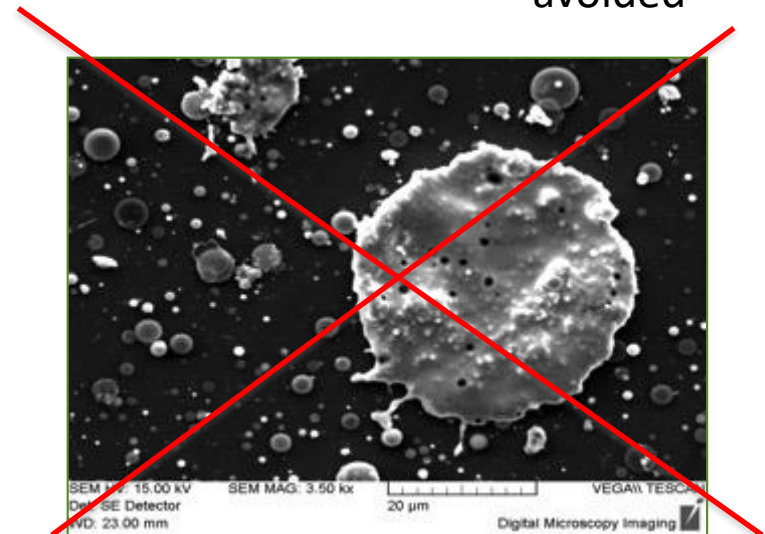
IPlasm – Main Features

✓ 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



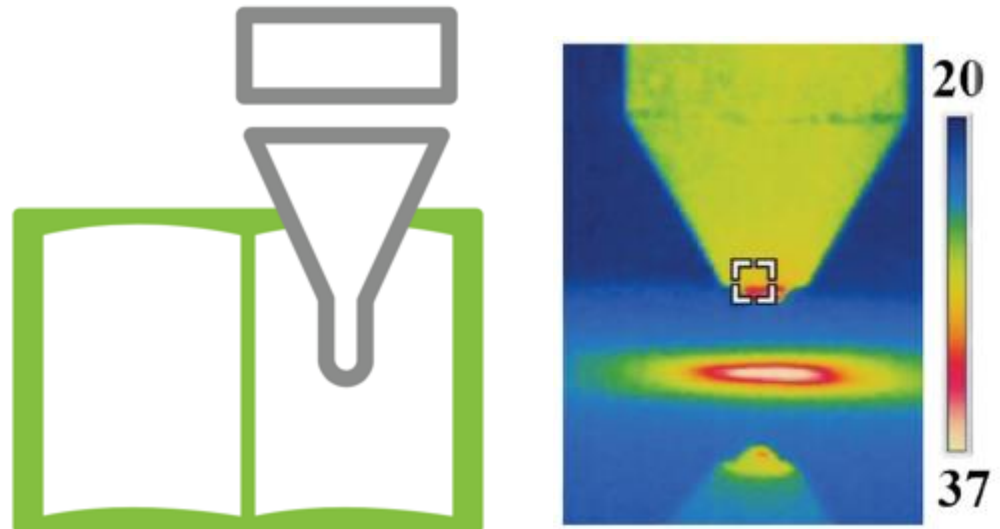
IPlasm – Main Features

- ✓ 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

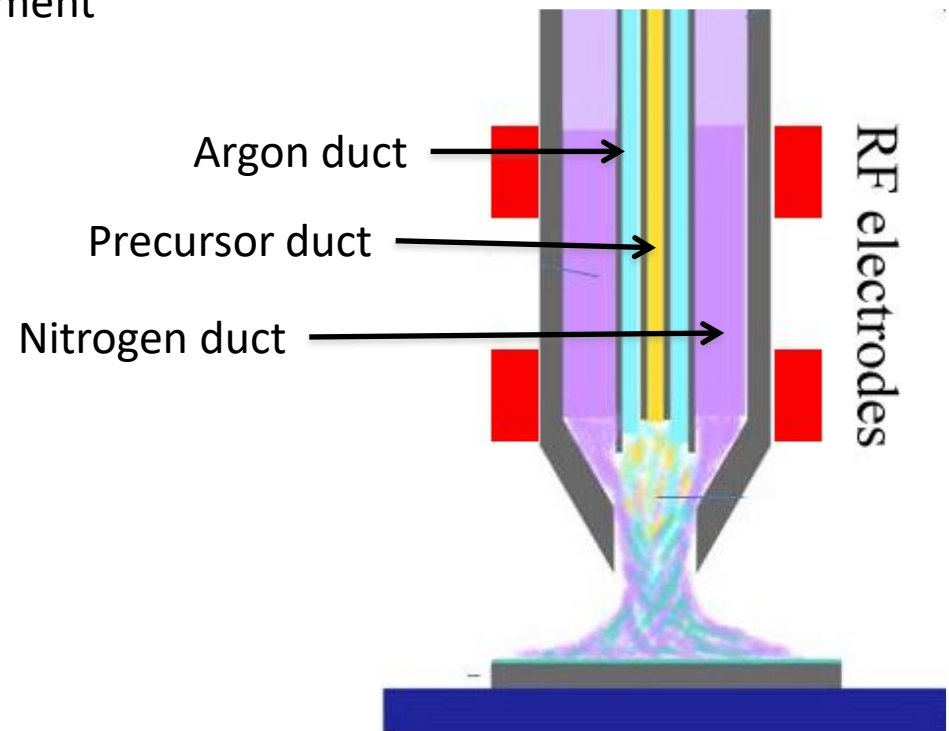
✓ Multiple coaxial design for

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

EFFICIENT



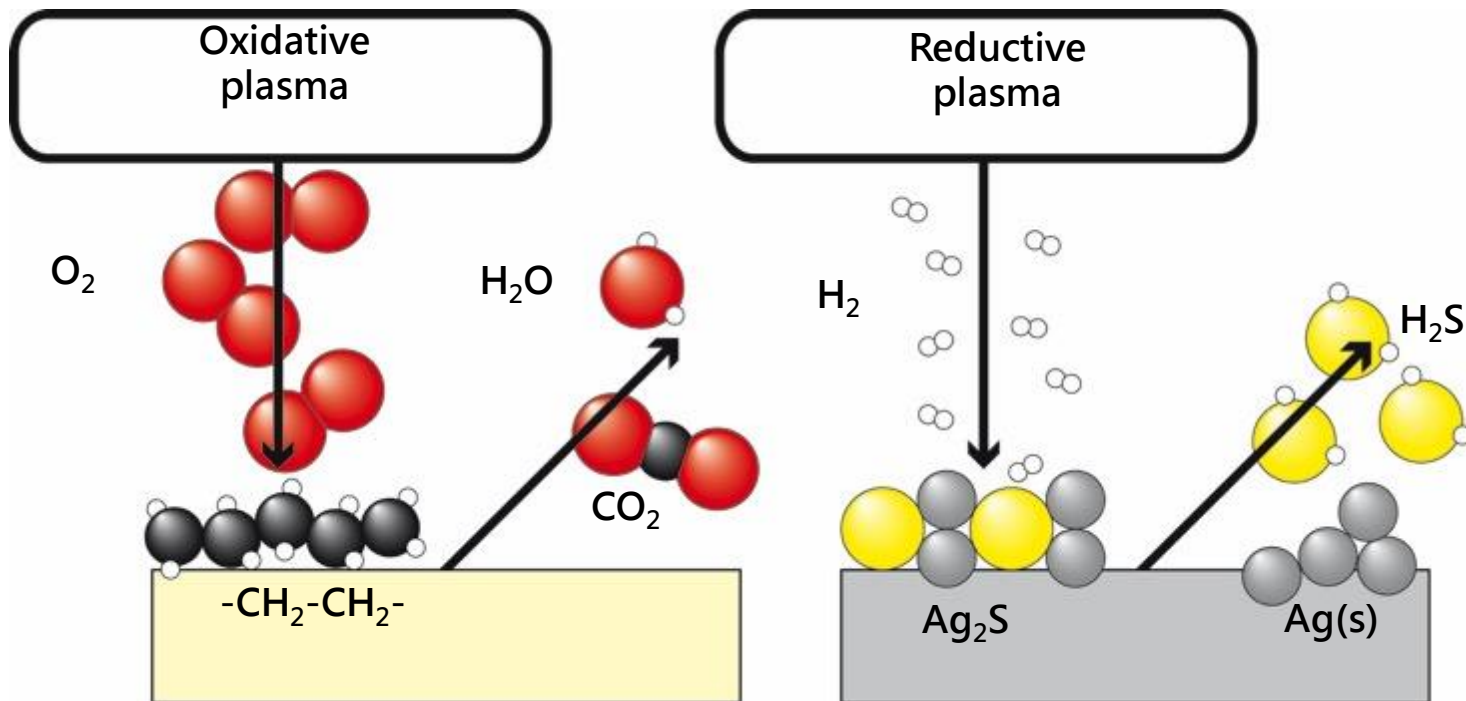
SURFACE CHEMICAL
FUNCTIONALISATION
AND
COATING DEPOSITION



IPlasm – Designed for CH

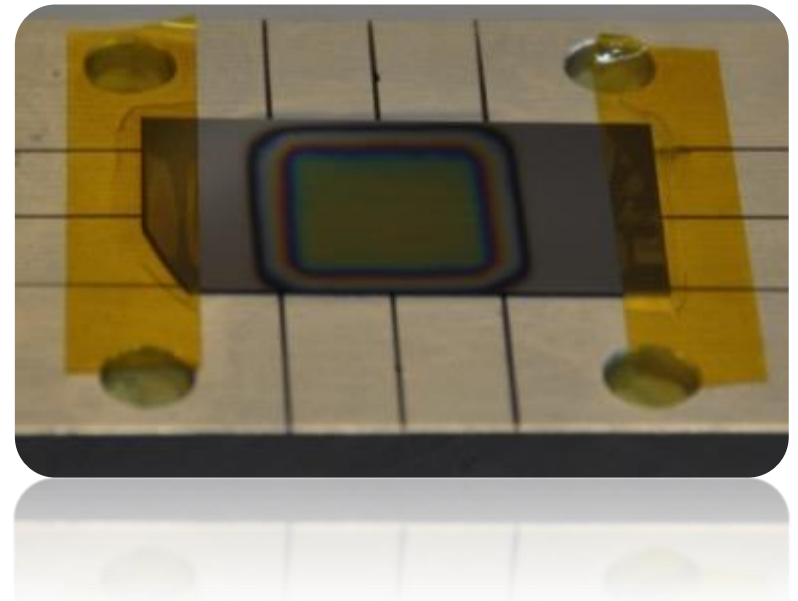
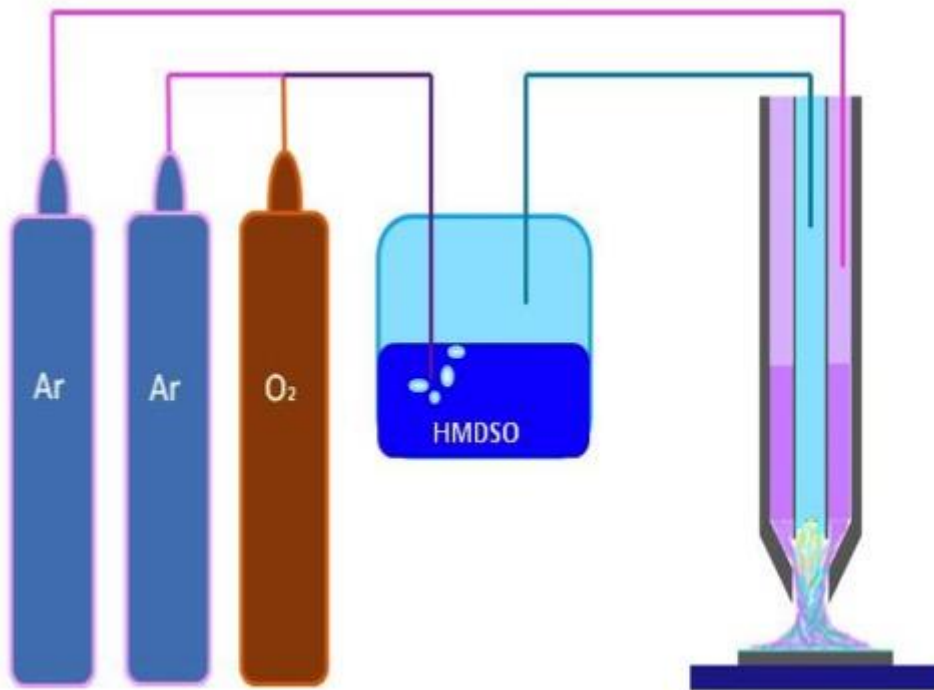
It allows to work with different Argon gas mixtures:

- Ar/O₂ is typically used for cleaning of polymeric substrates and for removal of unwanted organic layers
- Ar/H₂ is typically used for cleaning of oxidised layers from metals



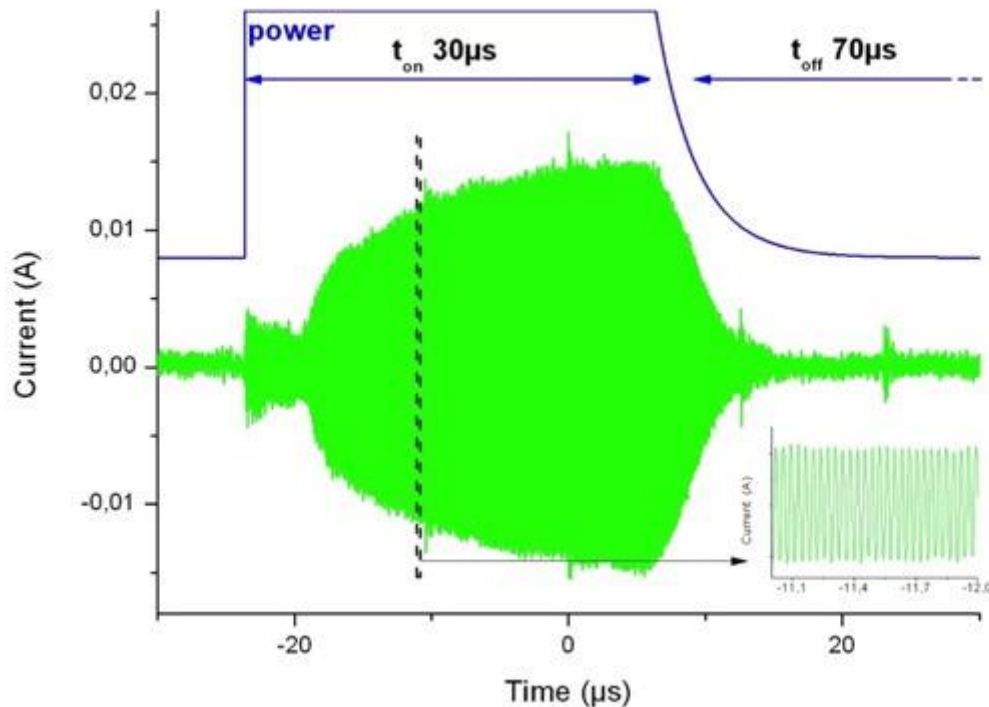
IPlasm – Designed for CH

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 ₂ 10-20 slm)

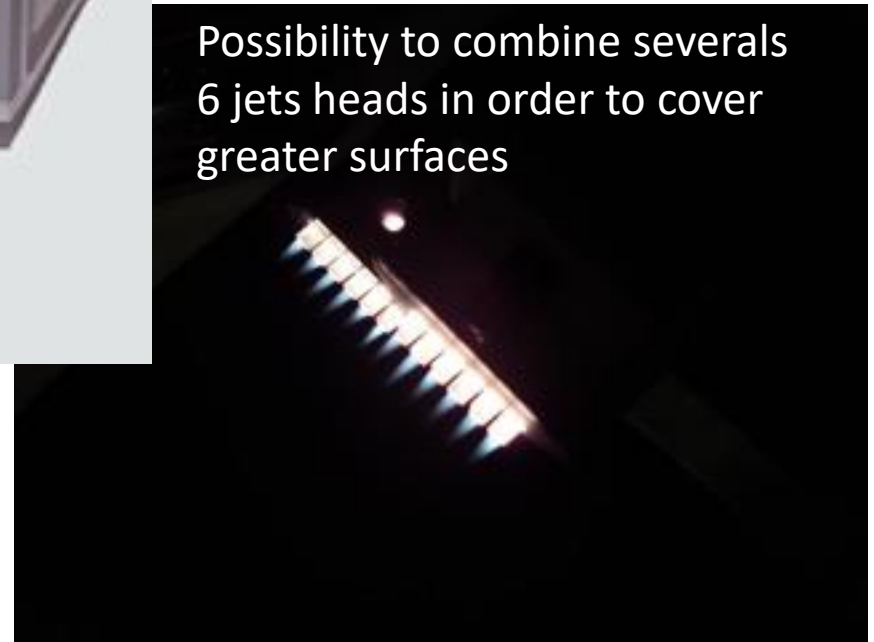
Treatment

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

IPlasm 6Jet – Specifications



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

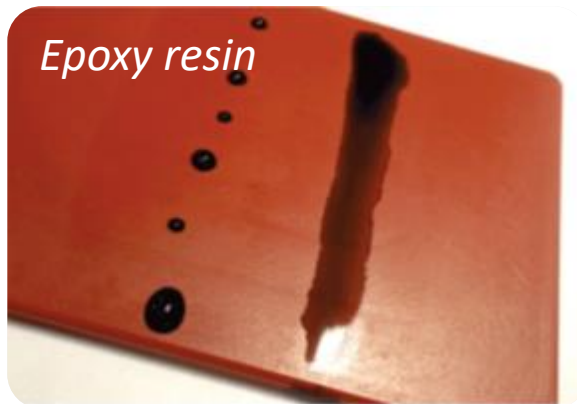


IPlasm Automation – Specifications



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

IPlasm – Applications



Surface activation and cleaning

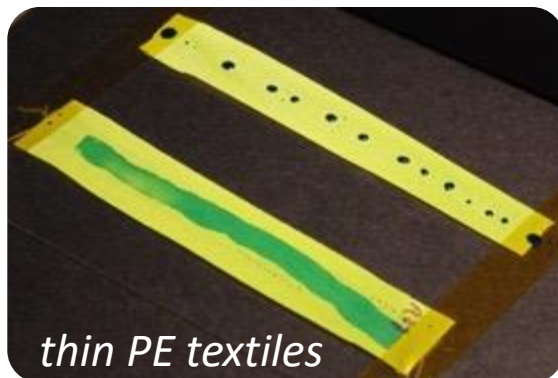
(before coating application)

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

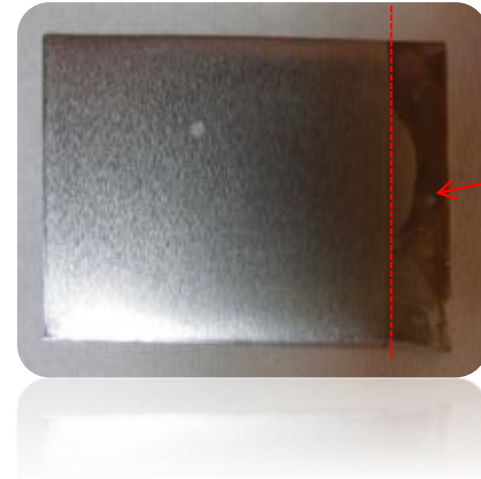
allow the replacement of common solvent-based primers, guaranteeing the desired adhesion performance with environmentally friendly and solvent-free processes.

IPlasm – Other Applications

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!

