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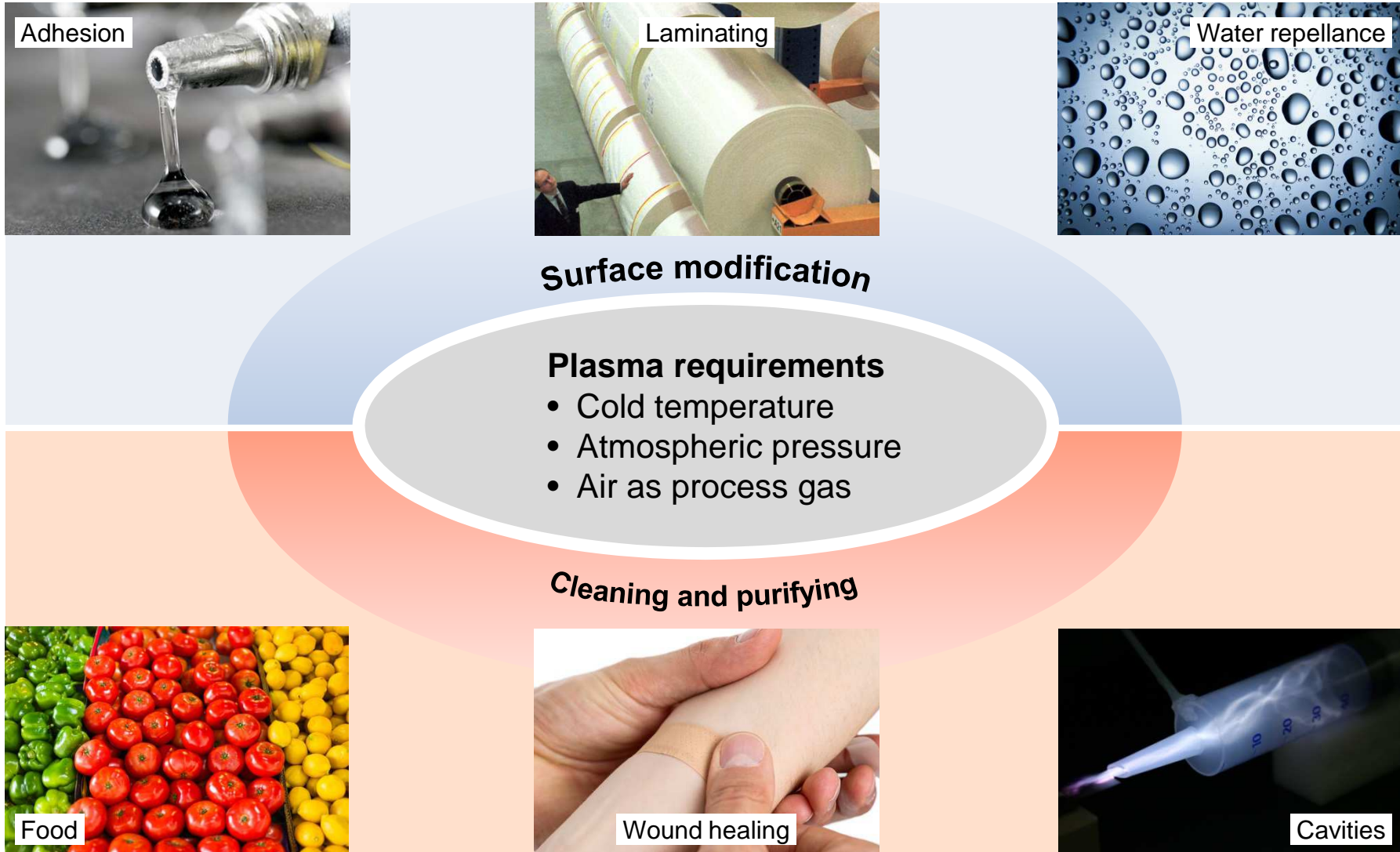
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CeraPlas™

A new kind of piezo-based cold plasma generator

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Plasma has a wide spectrum of potential uses!



Challenges for plasma sources

Drawbacks of grid-connected sources

High-voltage sources

- High input power (>100 W to 10 kW)
- High plasma temperature
- Large size

RF sources

- High input power (10 to 2000 W)
- High plasma temperature
- High operating frequency
- Large size

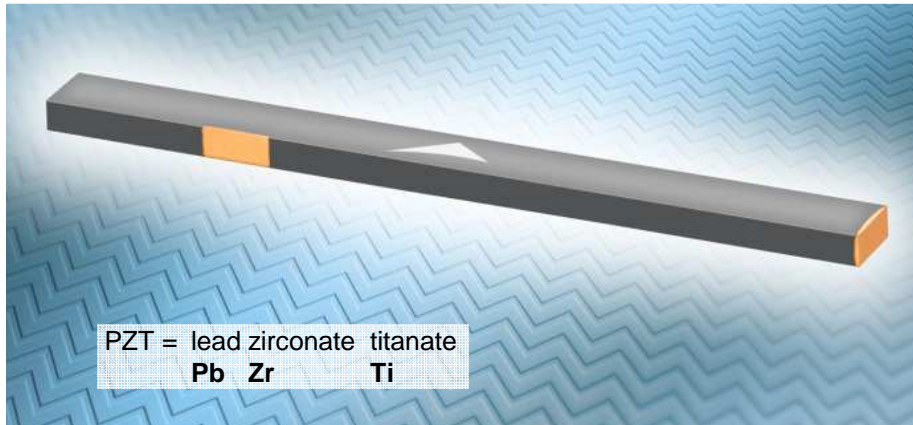
Dielectric barrier discharge sources

- High voltage source
- Constant distance required

Requirements for future sources

- No high-voltage cables or connectors
- Low plasma temperature
- Compact size
- Low power
- Suitability for battery-driven, handheld devices
- Atmospheric pressure
- Easy handling
- Ability to use different process gases
- High efficiency (ozone generation rate)

CeraPlas™ enables compact cold plasma solutions



- A completely new kind of plasma generator
- Based on multilayer technology with co-fired hard PZT ceramics and copper electrodes

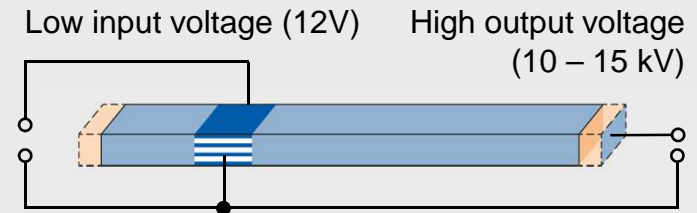
CeraPlas is an ideal component for generating cold plasma

- Voltage supply and plasma generation combined in a single component
- No special plasma generating electrode required
- Ignition directly in air or in industrial gases (e.g. Ar, N₂, He)
- No high-voltage plugs or cables needed
- Low plasma temperature (< 50 °C)
- High ozone generation rate
- Smaller and lighter and therefore well suited for handheld devices

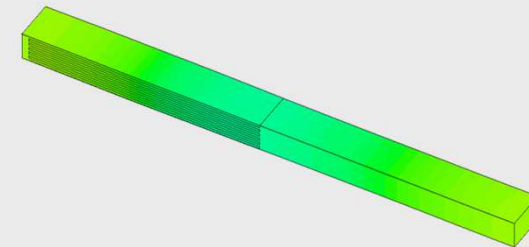
Combined voltage supply and plasma generator

High voltage generation

- A single piezoelectric component generates high voltage in minimum space

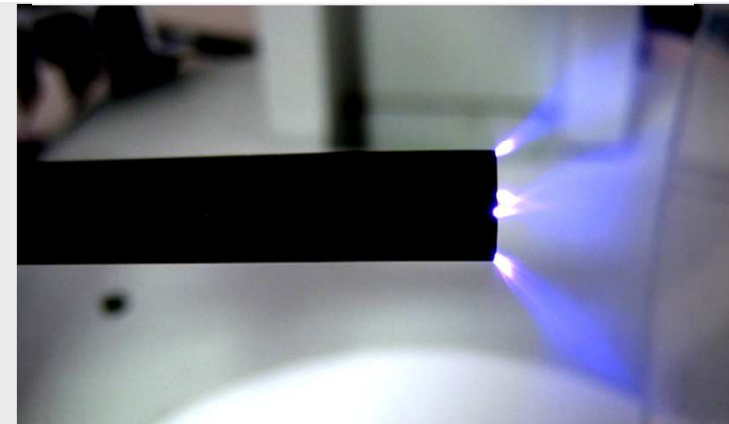


- Vibrating system with mechanically coupled input and output sides for the transformation of low input voltage to high output voltage



Plasma generation

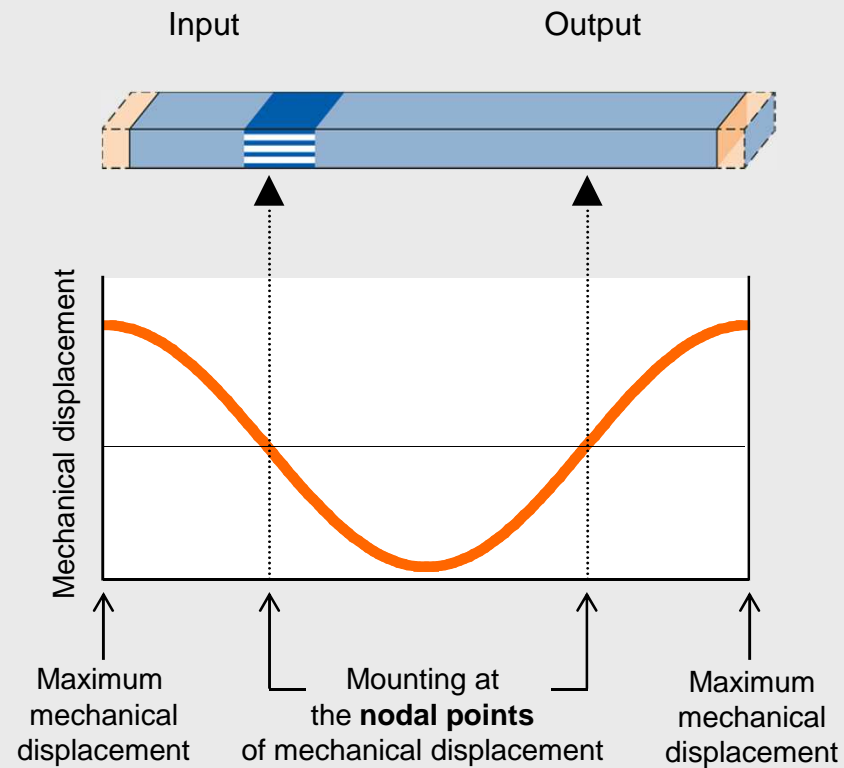
- Dielectric barrier discharge process on output electrode
- Electrical discharge between two electrodes separated by an insulating dielectric barrier by applying an alternating voltage



Fixation for optimum efficiency

Challenge

Create a reliable electrical connection and mounting without damping

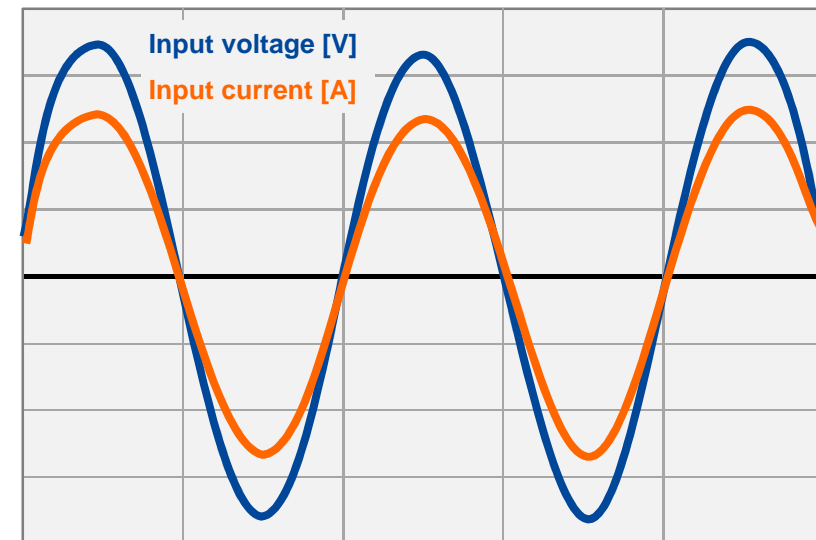


Mounting at the nodal points of mechanical displacement leads to optimum efficiency.

Driver specially developed for CeraPlas

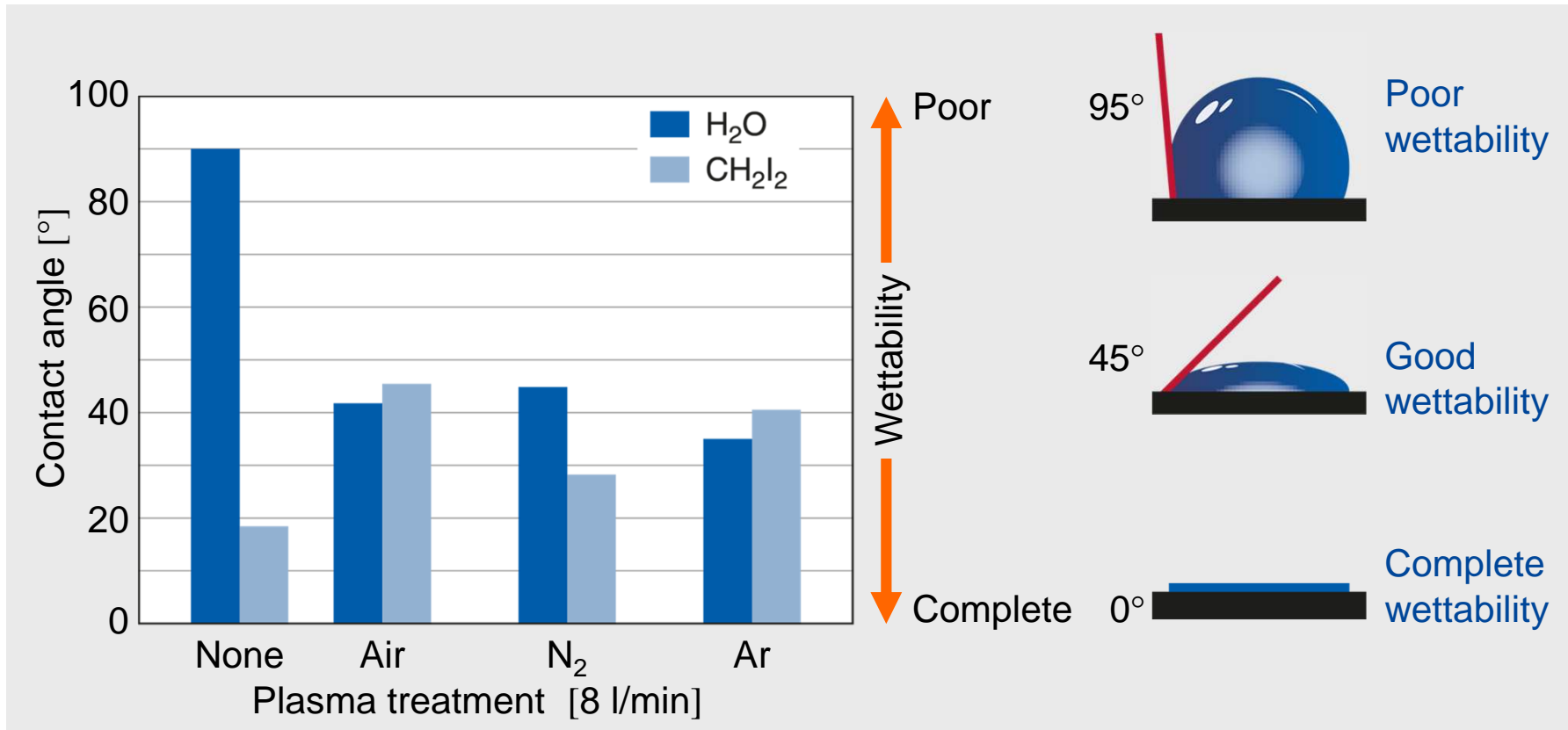
- Optimally matched to requirements of plasma generator
- New feedback control:
 - Compensation of transformer's input impedance for higher sensitivity and stability
- Miniaturized design
- Efficiency > 85% by using SMPS
- Operating frequency at parallel resonance
- Rapid regulation of load changes
- No hard switching

Driving voltage and current are in phase



CeraPlas driver enables plug-and-play solutions.



Superior surface activation performance



Measurement courtesy of relyon plasma

CeraPlas features a more effective surface activation than conventional techniques at a very low power input.

Component and module for plasma generation units

	CeraPlas™ component	CeraPlas™ module
		
Output voltage [kV]	Up to 15 (depending on load)	
Input voltage [V]	12 to 24 [V _{pp}]	12 to 15 [V]
Dimensions [mm]	72 x 6 x 2.8	72 x 6 x 2.8 (CeraPlas™) 100 x 25 (Driver)
Max. transferred power [W]	10	
Operating frequency f _{op} [kHz]	~ 50	
Plasma temperature	< 50 °C	
Process gas	Air and other industrial gases, e.g. N ₂ , Ar, He	
Ozone generation rate	High	
Materials	Hard PZT with copper electrodes	
Terminal	Solderable outer termination	Plug connector to power supply
Assembly	Soldered and connected at nodal points	Plug-and-play
Availability	Ex stock	On request

First product featuring CeraPlas™

New piezobrush PZ2 from relyon plasma

- Extremely efficient plasma generation
- Multiple process gases
- Low plasma temperature
- Very robust and reliable
- Compact design
- More efficient performance than low pressure plasma chambers
- High power density



First proof of benefits on a system level



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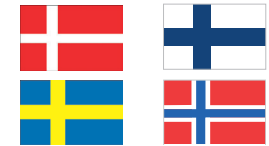
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