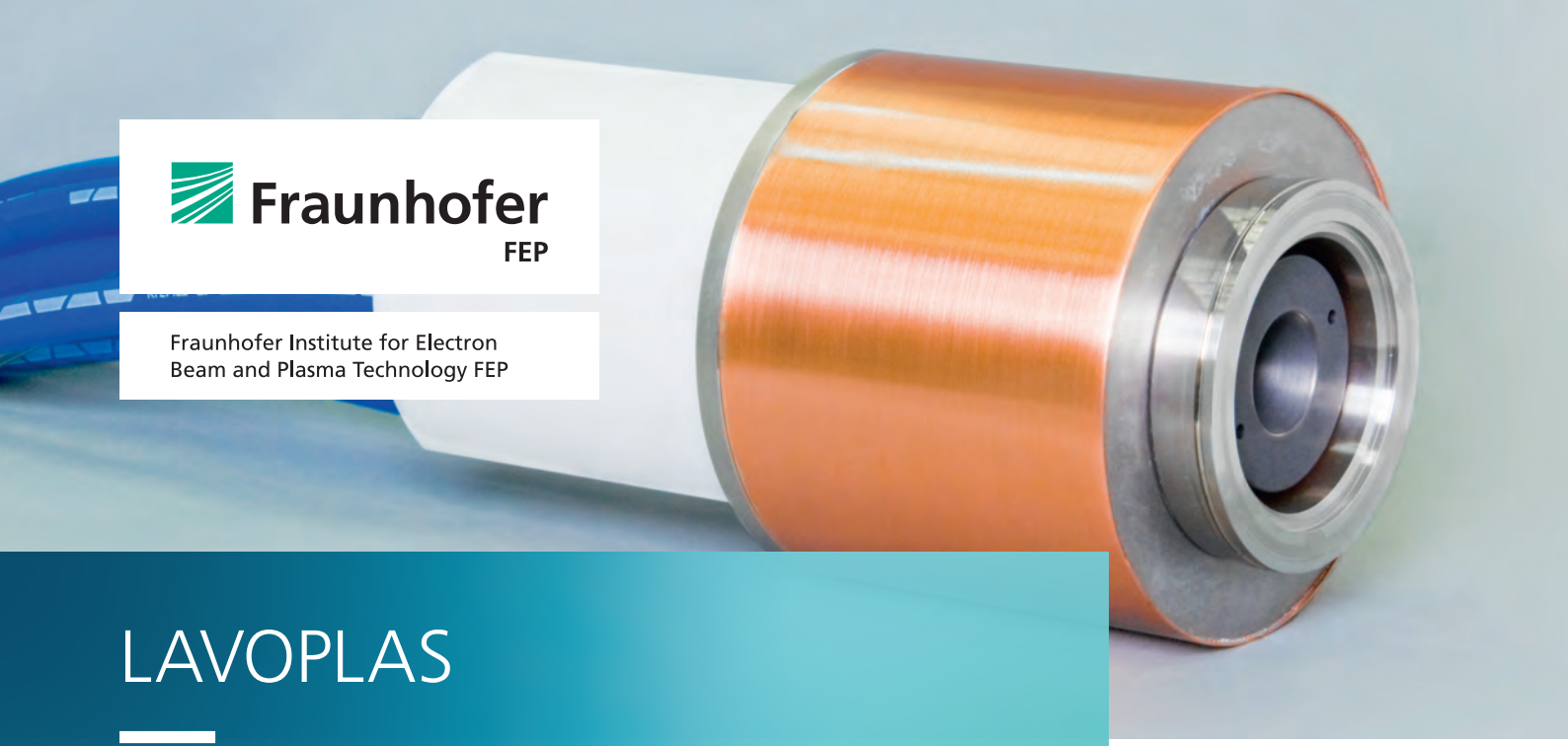


Fraunhofer FEP

Fraunhofer Institute for Electron Beam and Plasma Technology FEP

LAVOPLAS

Large Volume Plasma Source

Large Volume Plasma Source LAVOPLAS

Vacuum-based surface engineering and coating processes require plasma sources providing charge carriers for sputtering and activation effects. In order to achieve high homogeneity and efficiency, large volume plasmas with high charge carrier densities are of primary importance.

LAVOPLAS (Large Volume Plasma Source) supplied by Fraunhofer FEP is based on a magnetically enhanced hollow cathode arc discharge and provides homogeneous plasmas of high density and large operating distance. The plasma source is qualified for industrial use due to the compact and robust design, the stand-alone principle without the need of external components, the low working gas flow rate, and the high applicable plasma power.

LAVOPLAS has been established as a versatile processing tool in various applications such as high-rate plasma etching for substrate pre-treatment, plasma-activated evaporation of metal and oxide layers for corrosion protection, plasma-assisted reactive magnetron sputtering of hard and wear-resistant coatings, and plasma-enhanced chemical vapor deposition. Considerable improvements of film properties concerning morphology, corrosion protection, hardness, and abrasion resistance have been demonstrated.

Due to the large volume plasma expansion of up to 1 m^3, flexible or flat substrates of large area as well as non-even substrates of three-dimensional geometry, such as bulk and piece goods, can be treated.

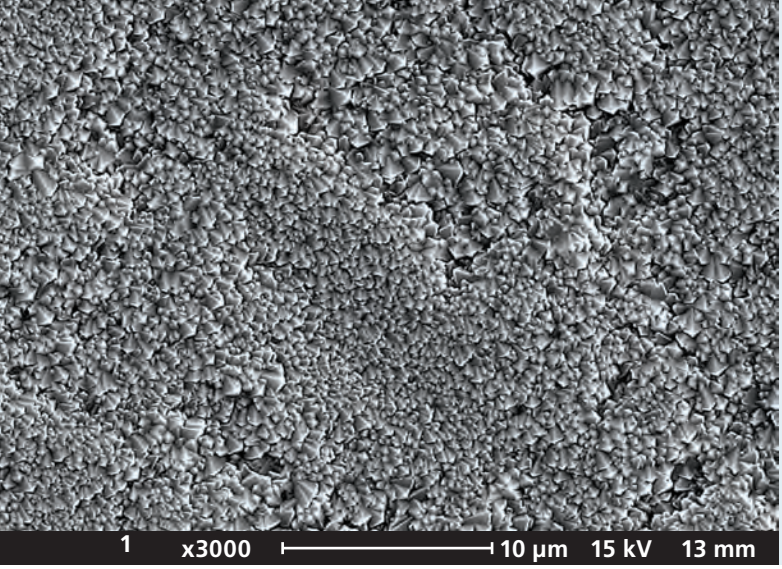
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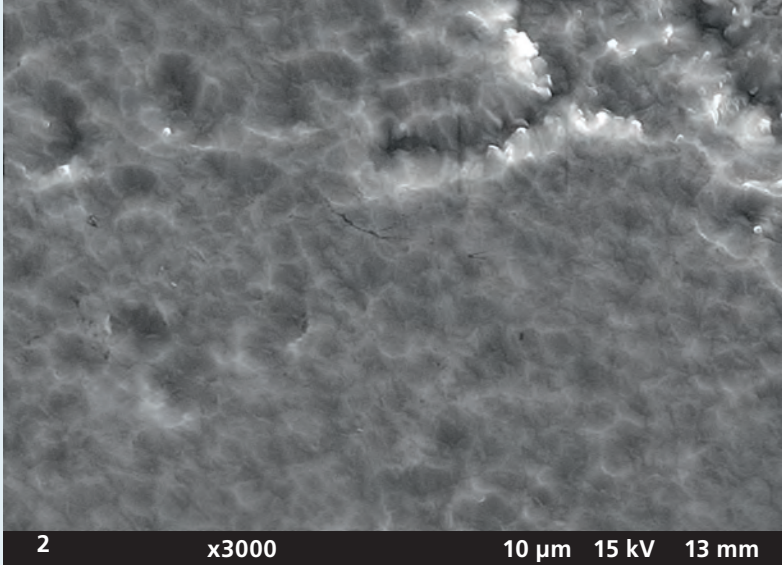
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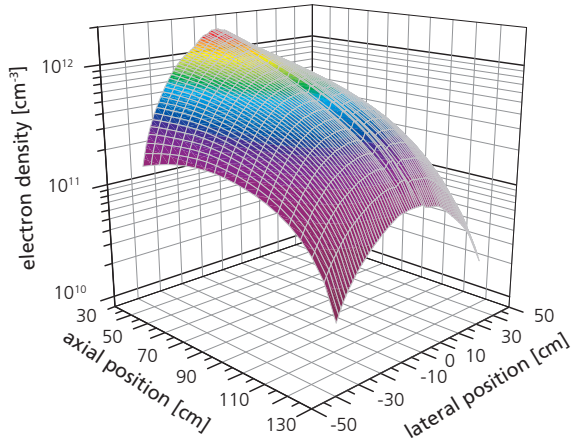
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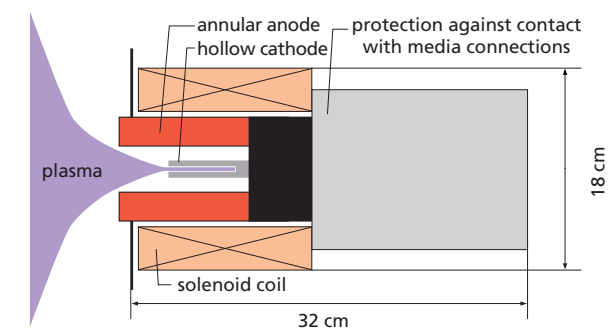


Technical specifications

Discharge current	50 ... 200 A
Discharge voltage	40 ... 300 V
Ignition voltage	1000 ... 1500 V
Power	max. 30 kW
Working gas flow	8 ... 200 sccm
Chamber pressure	10^{-2} ... 10 Pa
Required flange	DN 100
Dimensions	Diameter 18 cm, length 32 cm
Weight	35 kg



Plasma electron density distribution in a volume of 0.5 m³



Scheme of the LAVOPLAS

Technologies

- Plasma etching with ions accelerated by a negative bias voltage
- Substrate heating with plasma electrons accelerated by a positive bias voltage
- Ionization and excitation of evaporated or sputtered atoms for a denser film microstructure
- Ionization, excitation and dissociation of reactive gas molecules in order to enhance their reactivity on the substrate surface

Our offer

- Flange-mounted or built-in plasma source for pre-treatment and coating processes
- Adapted power supply including ignition module and solenoid power supply
- Feasibility studies and sample coatings as well as process development
- Commissioning and training

Scanning electron microscope pictures of evaporated aluminum on steel
1 *without plasma activation*
2 *with LAVOPLAS plasma activation*

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