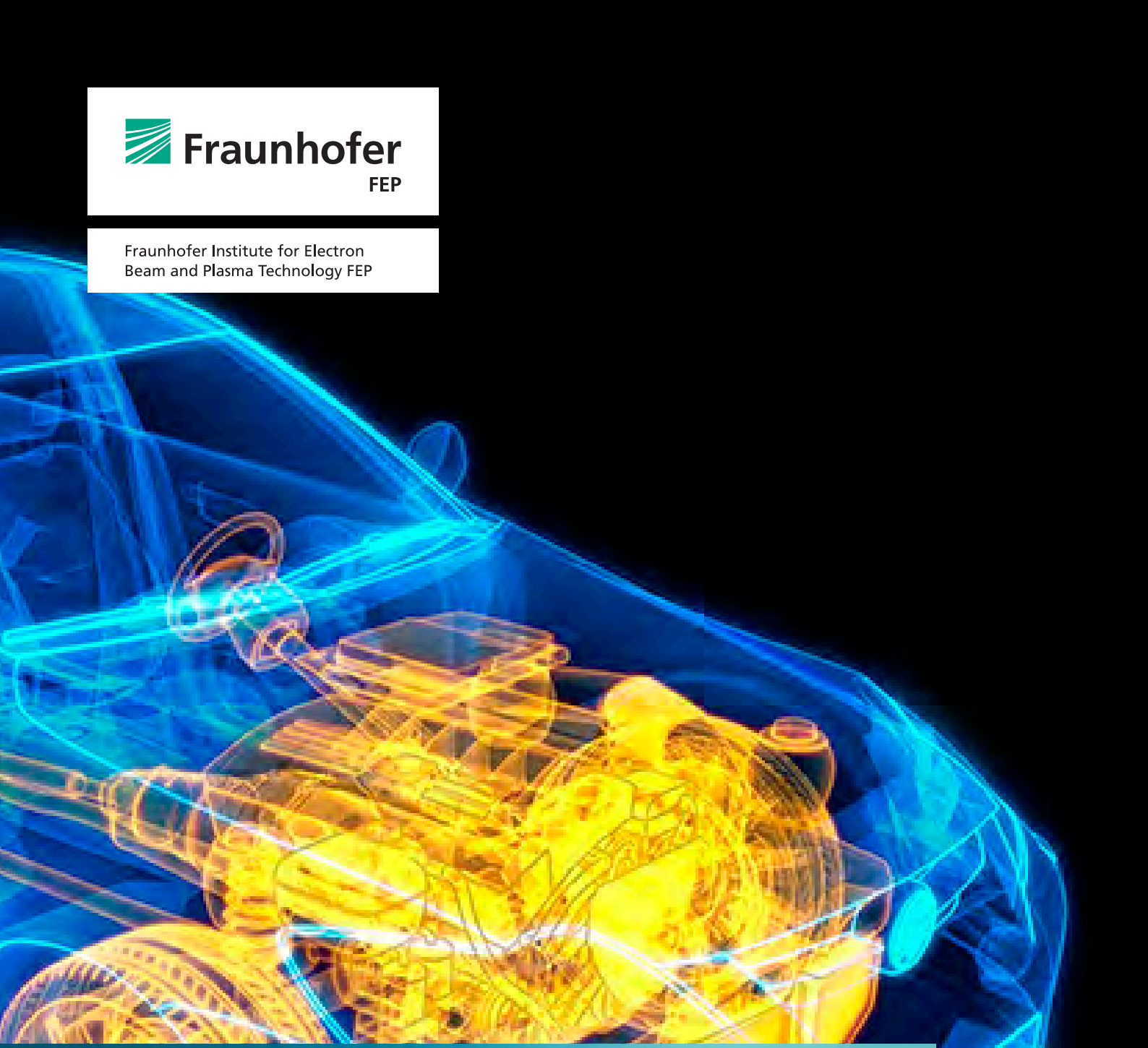
Fraunhofer
FEP

Fraunhofer Institute for Electron
Beam and Plasma Technology FEP



Technologies for automotive industry

Motivation and offer

For many years, the Fraunhofer FEP has consolidated comprehensive knowledge and technical know-how in the fields of electron beam and plasma technology. As a leading research and development institute in these fields, it is our aim to transfer these technologies into applications and to develop suitable and practice-oriented solutions for the challenges of our customers and partners.

The automotive industry is facing new and greater challenges in terms of cost efficiency, resource saving production processes and materials, safety, driving comfort and highest technical and design requirements.

Fraunhofer FEP offers solutions and technologies for a wide range of applications in the automotive industry, which can meet these challenges. Together with our partners we develop processes and procedures using electron beam and plasma technology up to pilot production and integration of ready-to-use solutions. A wide range of application scenarios are conceivable, from scratch and corrosion protection coatings for various components on car chassis or wheels to anti-reflective coatings for windows and thin-film systems for integrable radar sensors.

With our laboratory and pilot plants extensive possibilities from research and development up to pilot production and contract coating are available.

Discuss your ideas with us, together we will find a suitable solution according to your requirements!

»

The automotive industry is facing a variety of challenges such as the development of sustainable and efficient technologies and the demand for individual and highly integrated equipment.

With the innovative surface technologies of the Fraunhofer FEP, a wide range of functionalities for bodywork, optics or the interior can be realized and our solutions contribute to the optimization of many vehicle components for the mobility of tomorrow.«

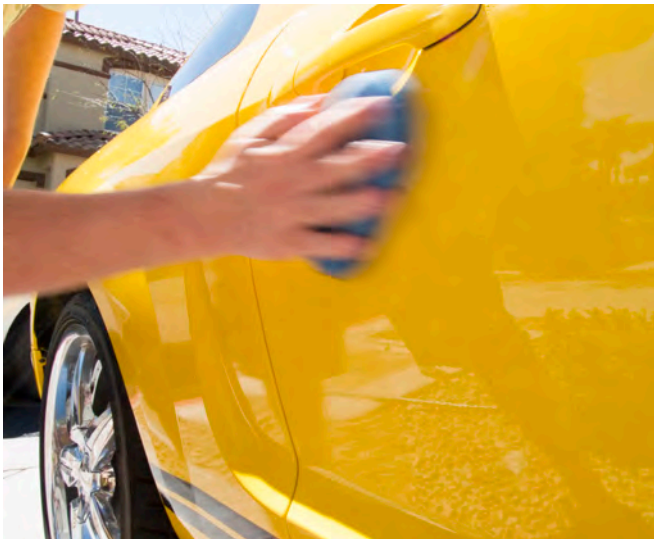
Dr. Jörg Neidhardt
Head of Department S2S Technologies and Precision Coating, Fraunhofer FEP

Car body

- Anticorrosive coatings
- Frost protection and scratch resistant coatings
- Antireflective coatings
- Surface modification for transparent car roofs and windows
  - hydrophobic coatings
  - antireflective coatings
  - transparent scratch protection (glass, plastic, metal)
  - hydrophilic, dirt-repellent easy-to-clean coatings
  - sun protection
  - de-icing coatings
- Electrochromic coatings for car windows
- Coatings for headlights
- Coloring by plasmonic layers
- Decorative layers by electron beam treatment

Wheels

- Coatings for rims
- Anticorrosive coatings for rims and brake rotors
- Dirt-repellent surface coatings
- Varnish hardening
- Cross-linking and recycling of rubber
- Coloring, decorative coatings of metal



Vehicle assembly / production process

- Analysis of contamination during the production process
  - particles, filmic impurities
- Development of cleaning processes for production
- Tool processing:
  - corrosion protection
  - wear protection
  - engraving / labeling
- Development of hardware for layer deposition up to the delivery of complete integrated packages, consisting of technology and hardware components

Communication and sensor technology

- Layers for sensor systems
  - TiO_X for gas sensors
  - electric insulation layers for pressure sensors
  - energy harvesting
- Optical precision coating for innovative diplays, e. g. holographic displays
- Sensor systems for engine diagnostics
  - pressure sensors
  - torsion sensors
- Optical solutions for innovative, full-surface (possibly holographic) HUDs

Interior

- Surface modification
- Surface treatment
  - hydrophobic, hydrophilic, dirt-repellent layers
  - broadband, angle-independent, colorless and antistatic antireflective coatings
  - antibacterial surfaces
- Production of airbag housings
- Crosslinking of polymers and textiles
- Sun protection films
- Plasmonic layers for coloring
- Curing of printing ink and decorative films using an electron beam
- High quality „glassy-like" surfaces

Powertrain

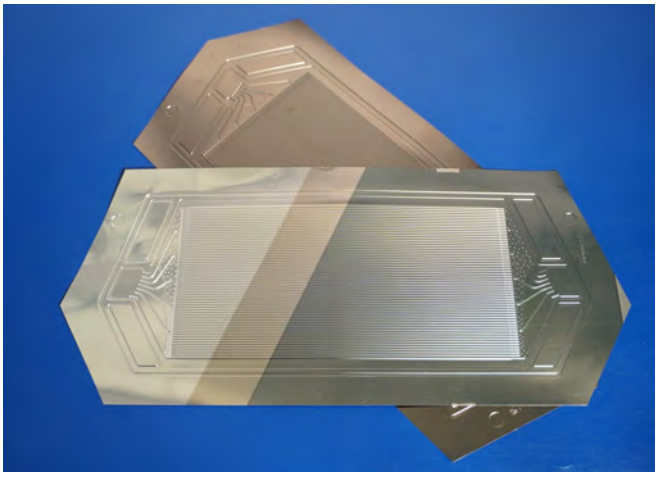
- Production of transmission shift gears
- Manufacture of camshafts by electron beam
- Wear protection (bearing shells with friction-reducing surfaces)
- Pressure sensors for registration of the engine pressure
- Integrated sensors in components, e. g. in drive trains
- Energy harvesting
- Active and passive sensor materials
- Improvement of the abrasion resistance of rubber seals

Batteries for electromobility

- Development of vacuum thin-film processes for battery systems, e. g.
  - process for the production of Si anodes
  - process for the deposition of solid electrolytes and electrodes
  - process for the deposition of protective layers for current collectors
  - metallized polymer films as reliable current collectors
  - production of porous layer structures with customized properties
  - production of pure lithium thin films on metal foil substrates by thermal evaporation in a vacuum
  - development of novel technologies for the production of electrochemical energy storage systems as an alternative to lithium-based battery systems (aluminum batteries)

Technologies for hydrogen applications

- Highly productive coating technologies for fuel cells
- Electron beam surface treatment: cross-linking of polymers to increase thermal stability, e. g. for novel bipolar plate materials
- Electron beam plasmas for the efficient, scalable plasma chemical synthesis of energy storage materials, e. g. ammonia and methanol
- Active sensor materials
- Purification processes along the entire production chain of H_2 applications



Research and pilot lines of the Fraunhofer FEP

The institute has numerous industry-related coating facilities for large surfaces, electron beam systems for efficient surface treatment and several clean rooms. Flat substrates made of glass, plastic or metal, flexible surfaces such as metallic strips, plastic films or flexible, ultra-thin glass as well as three-dimensional components can be finished with our equipment.

Equipment

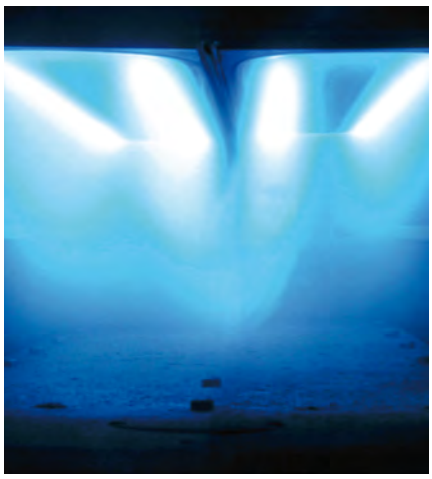
Technologies

Electron beam technologies
We utilize the thermal, chemical and biological effects of accelerated electrons in the energy range of 10 – 300 keV for technological developments suitable for industry and we qualify electron beam processes for specific applications. In addition, we design electron beam sources for various tasks and provide support in the realization of systems for our customers.

Sputter technologies
By applying thin layers using sputtering, surface properties such as hardness, corrosion resistance and optical properties can be specifically adjusted. We use and develop state-of-the-art sputtering methods to provide innovative solutions for complex coating requirements.

Plasma surface technologies
We develop plasma-activated coating processes for industrial-scale manufacturing as well as economical and high-quality large-area coating based on PVD and CVD processes. By plasma assistance layer properties can be varied in a broad range. We offer suitable plasma-based cleaning processes and plasma pre-treatment.

Further technologies
- Design of optical systems
- Energy-efficient short-time annealing
- Optical precision on large and curved surfaces
- Thin glass handling and coating as a lightweight construction material



Imprint

Fraunhofer Institute for
Electron Beam and Plasma Technology FEP
Winterbergstr. 28
01277 Dresden, Germany

Marketing
Annett Graf
Phone +49 351 2586-594
marketing@fep.fraunhofer.de

Scientific contact
Dr. Jörg Neidhardt
Phone +49 351 2586-280
joerg.neidhardt@fep.fraunhofer.de

www.fep.fraunhofer.de

Follow us!

We focus on quality and the ISO 9001.

TÜVRheinland ZERTIFIZIERT
Management System
ISO 9001:2015
ISO 50001:2018
www.tuv.com
ID 9105050079

Print product with financial
climate contribution
ClimatePartner.com/11151-2408-2292

Picture credits

Title: iStockphoto.com/fhgfep
Fraunhofer FEP: 7L, 7M, 7R
iStockphoto.com/fhgfep: 3L
Finn Hoyer: 5R, 6L
Anna Schroll: 4L, 4R
MarySan / shutterstock: 6R
m.mphoto / shutterstock: 3R
Janek Wiezoreck: 5L