



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 organic electronics, 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. Starting with anti-scratch or anti-corrosive coatings for a wide range of components of the car body or the wheels or antireflective coatings for the windows up to integrated OLED displays and sensors within the interior – many application scenarios are conceivable. 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!



Today's cars reflect our individual preferences. A variety of functions can be implemented through thin-films technologies in optics, lighting and interior as well as through novel systems for connected mobility.«

Dr. Torsten Kopte

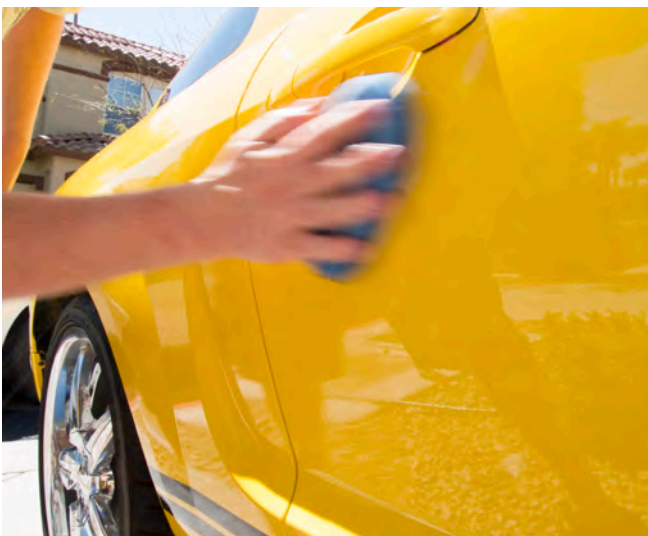
Head of Department Coating Metal, Energy Applications, Parts and Cleaning, Fraunhofer FEP

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 and roofs
- Organic solar cells for energy harvesting with functional web
- 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
- OLED microdisplays integrated in interactive data glasses for the use in assembly and logistics
- 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
- Precision coating for backlight for holographic displays
- OLED microdisplays for projection (dashboard)
- Bidirectional microdisplays for use in data glasses
 - displaying additional information
 - driver assistance systems, driver drowsiness detection
- Sensor systems for engine diagnostics
 - pressure sensors
 - torsion sensors
- TCO's as transparent conductive electrodes and electromagnetic filters for displays



Interior

- OLED microdisplays as intelligent display devices and for projection
- Microstructured OLED displays
- 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

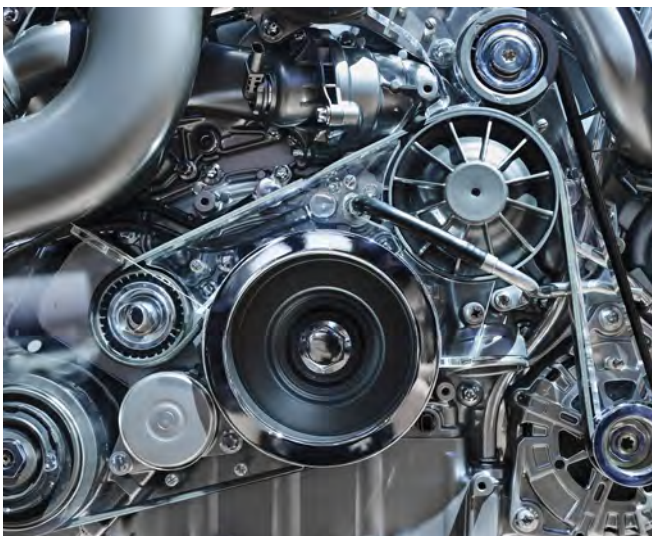


Powertrain

- 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
- Precise sensoric layers for gas sensors
- Improvement of the abrasion resistance of rubber seals

Batteries for electromobility

- Development of vacuum thin-film processes for battery systems, e.g.
 - processes for the production of Si anodes
 - processes for the deposition of solid electrolytes
 - processes for the deposition of protective layers for current collectors



Research and pilot lines of the Fraunhofer FEP

- EFFI – Electron beam machine for surface structuring and for fine and micro welding processes
- ILA 750 – Vertical in-line sputtering plant for flat substrates
- ILA 900 – Vertical in-line sputtering plant for coating large surfaces
- CLUSTER 300 – Plant for stationary magnetron sputtering
- LB nano – Laboratory unit for sputtering processes for nanostructuring
- LB9 – Laboratory unit for process development for coatings
- NOVELLA – Plant for the highly efficient high-rate electron beam deposition of 3D components
- UNIVERSA – Laboratory unit for 3D coating using pulse magnetron sputtering
- PreSensLine – Coating system for pulse magnetron sputtering and magnetron PECVD processes for large area precision coatings
- REAMODE – Laboratory unit for modifying organic materials using accelerated electrons
- MAXI – In-line vacuum coating plant for sheets and metal strips
- atmoFlex – Roll-to-roll pilot wet coating line for flexible materials using atmospheric pressure processes and electron beam crosslinking
- *novoFlex® 600* – Roll-to-roll pilot web coater for coating flexible materials using vacuum thin film processes
- *coFlex® 600* – Roll-to-roll pilot system for coating flexible materials by means of vacuum thin film processes
- Cleanroom Development and production line for wafer processing for microdisplays and sensors

Technologies

- Electron beam technology
- Sputtering
- Plasma-activated high-rate deposition
- High-rate PECVD
- OLED-on-Silicon
- IC and system design
- Technology transfer



Imprint

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