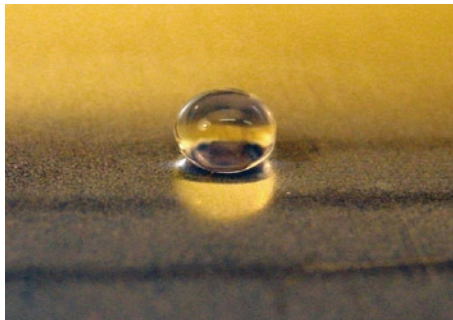


Atmospheric Pressure  
Plasma Technology  
AP Plasma Technology

Functional surfaces  
Thin film deposition

### New products via new surfaces

Entirely new or much improved product properties can be realized by coating the surfaces of materials, semi-finished products and consumer goods. Typical examples are coatings that provide an anti-soiling function, coatings that provide corrosion protection and coatings that give improved adhesion properties. Plasma techniques are particularly suitable for producing high-quality coating layers at favourable costs. Atmospheric pressure plasma techniques require no vacuum equipment and for that reason are ideal for in-line applications and the use of robots.

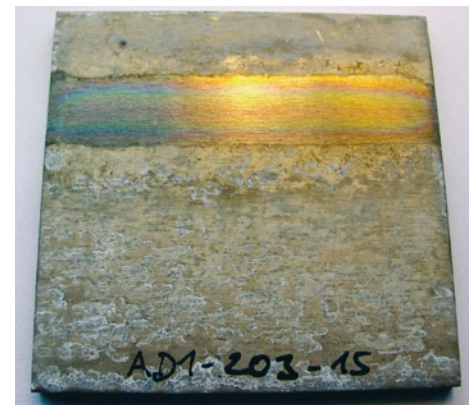


Water-repellent layer on aluminium with a contact angle of >100 degrees, produced by plasma coating at atmospheric pressure.

### Applications

Current examples of surfaces produced using atmospheric pressure plasma are hydrophobic and hydrophilic layers (20-70 mN/m) and corrosion protection layers. The coating processes currently employed strive for deposition rates that allow in-line coating at rates up to 200 m/min. Further aims of our research are the deposition of functional layers having the following properties:

- anti-adhesion
- adhesion promotion
- active corrosion protection
- »Easy-to-clean«
- »Anti-fog«
- tarnish protection for metals
- scratch protection
- electrical conductivity, e. g. for anti-static effects
- biofunctional surfaces, e. g. amine-functionalization



Aluminium plate after 96 hours of exposure to a salt-spray test. The shiny region was provided with a protective layer deposited under atmospheric pressure and shows no signs of corrosion.

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## Method

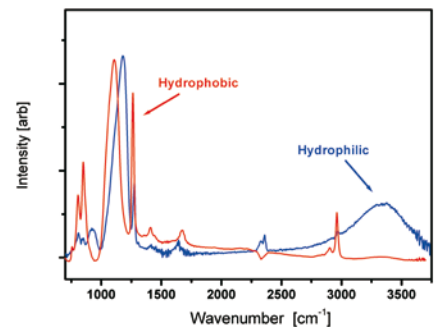
A commercial plasma system (Openair®-Plasma) is used at the Fraunhofer IFAM. This system was modified at IFAM for the deposition of functional layers. In this process, a plasma is generated within a nozzle and is mixed with a reactive chemical compound at the nozzle outlet. Contact of the exiting plasma beam with the surface results in layer deposition. Within the framework of research projects (mainly collaborative projects with industrial partners), the layer functions and layer properties are being constantly improved and adapted to customers' needs (e. g. adhesion of layers to different substrates).

By using a single nozzle, individual points and/or sections can be coated. Large-area components can, however, also be coated by using a suitable assembly of several nozzles.



Plasma nozzle assembly for coating large-area substrates.

Research on improving the properties of the deposited layers is being accompanied by practical functional tests and analysis of the deposited layers using instrumental surface analysis techniques.



IR-spectra of hydrophilic and hydrophobic layers deposited using atmospheric pressure plasma.

## At a glance

### Benefits

- suitable for in-line applications
- use of robots possible
- point-selective coating
- use of compressed air as process gas
- plasma requires no noble gas
- environmentally friendly
- low chemical consumption

### Our offer

- adaptation of coatings to your specific requirements
- development of new layer functions
- provision of sample materials
- plant transfer to your production
- technology transfer