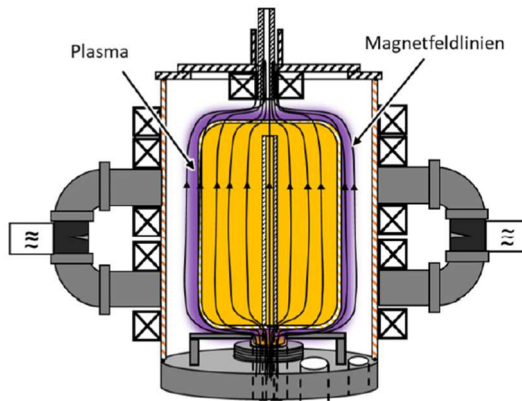


## RWTH Technologie

### Plasma process for coating the outer and inner walls of plastic bottles



#### Challenge

Since plastics are light and inexpensive, they are used as packaging material in many areas. For certain applications, such as in the food sector, the classic packaging plastics must be equipped with an additional barrier function against gases and other substances in order to guarantee the shelf life of the product. One possibility for this is plasma-assisted vapour deposition, which can be used to create barrier layers on plastics. A disadvantage of the state of the art is that the barrier performance of the coatings is still too low for certain applications. With the available coating plant technology, the containers are only coated from the inside. An external coating would enable the necessary increase in barrier performance. The greatest difficulty here, however, is the parasitic co-coating of plant components when the plasma is also ignited outside the container.

#### Solution

This challenge is solved by generating a magnetic field for the external coating simultaneously to the classical plasma excitation by means of microwaves via a suitable coil arrangement, which homogenises the plasma along the field lines and at the same time keeps it away from the chamber walls by means of a magnetic confinement. The easiest way to achieve this magnetic confinement is with cylindrical coils, since the magnetic field of such a coil is directed parallel to the coil axis, which prevents the particles from being lost in the radial direction. In order to confine the plasma at the ends of the coils, so-called magnetic mirrors are used. Here, the field lines of the magnetic field are forced to take a bottle-neck-shaped course, so that the field lines are largely bent back into themselves inside the confinement volume. With this device, the plasma can be limited to the immediate vicinity of the surface to be treated and kept away from the reactor walls.

#### Advantages

- Higher barrier performance of the coatings through double-walled coating
- Higher coating deposition rate due to magnetic field-induced increase in plasma density
- Reduced maintenance of coating reactors due to avoidance of parasitic co-coating of reactor walls

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#### Fields of application

Plastics, plastic packaging, barrier technology, food packaging

#### Keywords

#plastics, #plasma, #PECVD,  
#packaging, #coatings

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