

# PRESS RELEASE

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PRESS RELEASE

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## Surface modification using accelerated electrons: fast, gentle, precise, stable and durable

**The Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, a provider of research and development in the area of surface functionalization, will be presenting research results from the field of biofunctionalization and hygienization at the 13th ThGOT Thementage Grenz- and Oberflächentechnik in Zeulenroda, Germany, March 13 – 15, 2018.**

Surfaces must satisfy a wide range of requirements: they need to be decorative, and even contribute substantially to hygiene. They also play a large role in biomedicine.

There are numerous processes for functionalizing surfaces, depending on the application. Many are already well established and others are still under development by scientists throughout the world. Scientists at Fraunhofer FEP have already been working for a considerable time on functionalizing surfaces for the medical technology field. In addition to coating technologies, accelerated low-energy electrons are also employed for this purpose. The surface is selectively treated with these electrons in order to achieve suitable properties. Besides antibacterial effects, “self-cleaning” surfaces can also be created in this way.

Electron beam treatment can result in a modification of the wetting characteristics for the surface (surface hydrophilicity), for example. In this way, the interaction of the surface with the environment can be selectively influenced. Human cells attach better, while bacteria in turn are rejected.

The order of magnitude of the dimensions for which this modification was able to be carried out is particularly noteworthy. Finely masking of samples with a lattice structure produced alternate hydrophilic (good wetting) and hydrophobic (poor wetting) surface areas with 100 µm separations. These very fine features characterized by differing surface energies are suited to lab-on-a-chip systems, for example, or for individualized growth patterns.

Gaby Gotzmann, head of hygienization, sterilization, and biofunctionalization at Fraunhofer FEP, explains: “While conventional processes often produce only temporary effects on surfaces, treatment with accelerated electrons leads to stable surfaces over a longer period. On suitable surfaces, the relevant areas can be treated very precisely, achieving penetration depths of even microns.”

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Functionalization by means of electron beam was achieved rapidly. The challenge, however, lay in investigating the fundamental mechanisms of the effects in order to be able to reliably produce the results in the future. How the functionalization can be influenced by process parameters, needed to be explored. To accomplish this, comprehensive parametric studies were carried out by varying specific process parameters like atmosphere and incident energy, as well as in vitro cell tests that finally confirmed these insights.

The scientists are now able to set up a precise surface treatment procedure using electron beams for numerous surface applications in medical engineering and are seeking industrial partners for jointly producing functionalized surfaces.

### Fraunhofer FEP at the 13<sup>th</sup> annual ThGOT 2018:

#### Exhibition booth

#### Conference presentation:

- „Langlebige Implantate – Herausforderungen an die Implantat-Knochenschnittstelle“  
Gaby Gotzmann, 15.03.2018, 4:20 p.m.
- „Piezoelektrische AlN- und AlScN-Schichten für die energieautarke Sensorik“  
Hagen Bartzsch, 13.03.2018, 1:50 p.m.

#### Poster:

- Electron beam curing of elastomers for 3D printing of biocompatible medical products
- Elektronenstrahlbasierte Fixierung von organischen Stoffen an medizintechnische Oberflächen



**Wetting properties of functionalized surfaces with various liquids**

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The **Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP** works on innovative solutions in the fields of vacuum coating, surface treatment as well as organic semiconductors. The core competences electron beam technology, sputtering and plasma-activated deposition, high-rate PECVD as well as technologies for the organic electronics and IC/system design provide a basis for these activities. Thus, Fraunhofer FEP offers a wide range of possibilities for research, development and pilot production, especially for the processing, sterilization, structuring and refining of surfaces as well as OLED microdisplays, organic and inorganic sensors, optical filters and flexible OLED lighting. Our aim is to seize the innovation potential of the electron beam, plasma technology and organic electronics for new production processes and devices and to make it available for our customers.