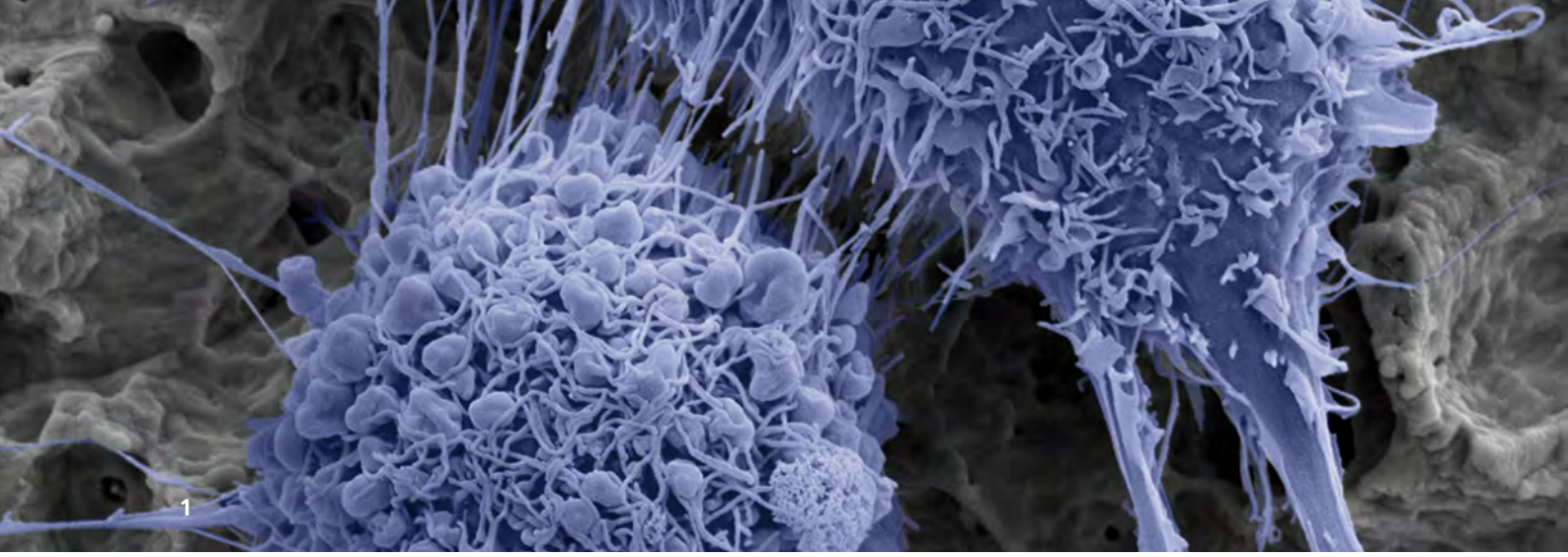

COATINGS FOR MEDICAL TECHNOLOGY

Coatings and surface functionalization are used in medical technology to give new material properties to well-known products or to alter their existing material properties. The range of possible applications is endless; it includes functionalizing silicon surfaces, optimizing the surface feel, and color-coding implants to avoid confusion as well as using bioactive coatings that optimize surface bone cell growth and antimicrobial functions.

The Fraunhofer IFAM has many years of experience in the area of antimicrobial, biocompatible, and non-cytotoxic coatings. These coatings are used to reduce the risk of infection following implantation of tooth replacements and to improve the long-term success of the implants. The DentaPlas coating was developed in cooperation with the medical industry. It inhibits the growth of bacteria on its surface, which means the implant can grow in better and become permanently anchored in the jaw. The researchers combined surface materials with different physical and chemical properties. The DentaPlas coating has a rough structure, which cells can easily grow on, and it is combined with a hydrophilic plasma polymer coat, which attracts water. While only 100 nanometers thick, the researchers integrated silver nanoparticles into the plasma polymer layer, where they continually release antimicrobial silver ions.

Another example of our work in our core competency of surface technology is that of atmospheric coating technology for implant color-coding. This was developed to help avoid the confusion of implants during surgery. The current developments focus on the integration of a data matrix or QR codes to create a unique device identification for the medical product. Using physical vapor deposition, polymer implants such as PEEK can be coated with titanium, ensuring the implant is biocompatible. The researchers were successful in increasing the titanium's adhesion to the PEEK with a special adhesion layer, preventing the possibility of detachment.

Another method of influencing the interaction between cells and the medical implant is that of controlling surface energy. For example, changing from a hydrophobic to a hydrophilic surface using plasma activation can significantly affect cell adhesion. The macroscopic surface structure is an important parameter for such adhesion. Laser structuring can give bone cells a growth boost, and these structured areas can be selectively applied to orthopedic implants, making them especially attractive for the bone cells.

1 *Two HeLa cells interacting on a functionalized surface.*