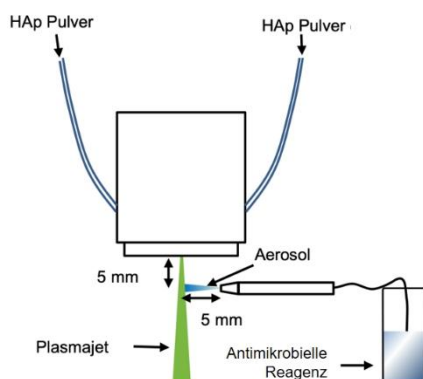


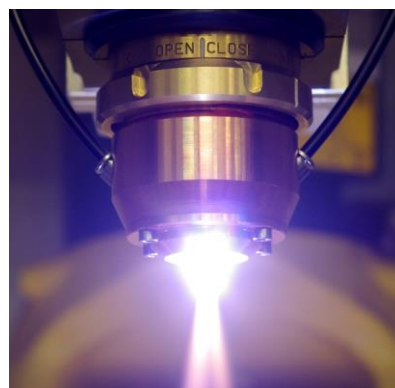
# Bioactive hydroxyapatite coatings on PEEK substrates using cold plasma spraying

## Technology Transfer offer

Thermoplastic high-performance polymers such as polyether ether ketone (PEEK) possess mechanical properties that are nearly identical to those of human bone material. This makes PEEK a promising bone substitute material for medical applications. In order to increase the bioactivity of PEEK, hydroxyapatite (HAp) coatings can be deposited on PEEK surfaces using cold plasma spraying. The firmly adhered HAp coatings exhibit a porous structure suitable for bone cell growth. At the same time, these coatings can be functionalized with antimicrobial surface properties.



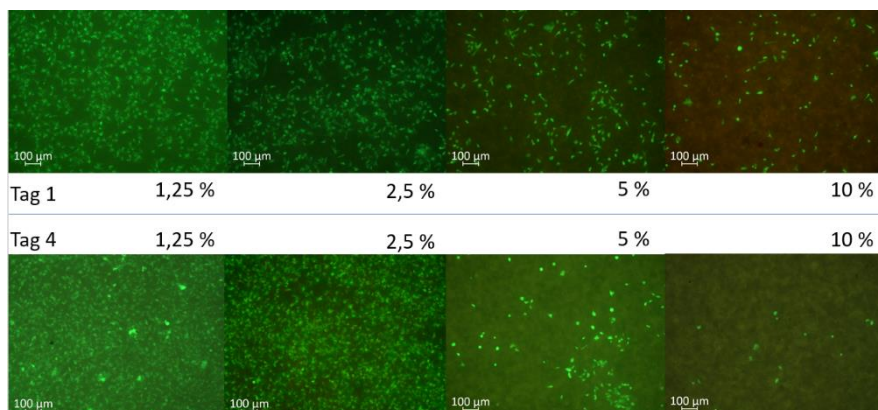
*Schematic representation of the process combination of Cold Plasma Spraying (CoPla) and Suspension Precursor Plasma Spraying (SPPS)*



*IC3 plasma jet system for cold plasma spraying of HAp coatings*

## Solution

By introducing suitable powder materials (HAp powder, HAp-ZnO mixed powder) into a plasma jet or by additionally dosing an antimicrobial agent as an aerosol into the plasma jet, these materials can be applied as firmly adhered bioactive coatings even on thermally sensitive substrates such as PEEK.



These coatings have been specifically investigated with regard to layer thickness, topography, phase composition, adhesion properties, as well as antimicrobial and cytotoxic characteristics.

*Results of LIVE/DEAD cell viability tests using MC3T3 osteoblasts. The tests were carried out on HAp-coated PEEK samples, whereby the proportion of antimicrobial ZnO powder in the initial mixed powder was varied between 1.25% and 10%.*

## Advantages

- **Provision of biocompatible coatings on implant materials like PEEK, ensuring minimal impact on the mechanical properties of the base material.**
- **Direct incorporation of the antimicrobial agent at the surface.**
- **Porous surface for enhanced cell growth.**

## Development Status and Intellectual Property

- **Plasma treatment of PEEK material is feasible.**
- **Development of a novel CoPla-SPPS process combination.**
- **Structural and morphological characterization of HAp coatings has been carried out.**
- **Antimicrobial characterization is ongoing.**

**Literatur:** J. Xu, M. Körner, A. Henning, J. Schmidt, A. Pfuch, S. Spange; „Mit Kaltplasmaspritzen die Bioaktivität von Kunststoffknochenersatz verbessern“, Galvanotechnik 07/2022, S. 1100-1103