

**FESTEL CAPITAL**

Dr. Gunter Festel  
Schuermattstr. 1, CH-6331 Huenenberg  
Phone +41 41 780 1643  
Mobile +41 796 527 112  
Email [gunter.festel@festel.com](mailto:gunter.festel@festel.com)



## Gradient Coating on the Basis of SiCN(-M) Precursors for Metal Implants

### Summary

The use of titanium and titanium alloys in medicine, especially as implant material for artificial joints, is limited by their low wear resistance. By *in situ*-reaction of preceramic precursors of the SiCN system with cp-titanium or titanium alloys, hard phases on the material surface are generated. Wear resistance investigations indicate the potential of these novel gradient materials for the use in improved implants. Through dip and spray coating techniques the production can be carried out at low temperatures and low-cost.

Industrial partners are sought for various possible commercialisation options.

### Background

FESTEL CAPITAL is supporting a German university to commercialise an innovative precursor coating that increases wear resistance and reduces the liberation of metal ions from implants.

### Description

The SiCN-precursor/solvent-solution is used for dip coating titanium materials. In a consecutive heat treatment, diffusion processes and the *in situ*-reaction between the titanium and precursor occur. Hard titanium nitride, carbide and silicide phases are generated. The diffusion reaction leads to a gradient up to a depth of more than 10  $\mu\text{m}$ , with the surface hardness being increased up to three times the value of the original substrate. The cytocompatibility of titanium materials is not influenced by this process. The friction coefficient against ultra high molecular weight polyethylene (UHMWPE) is reduced by the gradient layer to values obtained by the combination TiN-coating/UHMWPE. No abrasion was detected.

## **Application areas**

Titanium and titanium alloys for medical applications, e.g. artificial joints.

## **Advantages**

Advantages this technology offers include the following:

- Surface hardening by gradient layers
- Production at low temperatures and low-cost by dip- and spray-coating techniques
- Improvement of wear resistance
- Decrease of friction coefficient

## **Investment Opportunity**

The aim of FESTEL CAPITAL is to commercialise this innovative implant material modification. In the search for industrial partners different commercialisation options, such as out-licensing or a sale of all relevant intellectual property and know-how, are possible. Detailed information can be provided after the signing of a confidentiality agreement.

## **Disclaimer**

FESTEL CAPITAL has prepared this document to the best of FESTEL CAPITAL's knowledge and belief based on all available information. FESTEL CAPITAL takes no warranty for the accuracy and completeness of this information. Therefore, all liability for costs or damage resulting from information and conclusions in this document is excluded.

## **About FESTEL CAPITAL**

FESTEL CAPITAL is an advisory and investment firm focusing on the commercialisation of technologies in the areas of energy, environment, health, materials and nutrition.

CONTACT: Dr. Gunter Festel, Schuermattstrasse 1, CH-6331 Huenenberg/Zug, Phone +41 41 780 1643, Mobile +41 796 527 112, E-Mail [gunter.festel@festel.com](mailto:gunter.festel@festel.com).