

Implant surface:

„Shot peening“

“Acid etching“

*The aim of developing this new implant surface was the promotion of the quality to receive reliable technical results. Stable results support the osseointegration in clinical use of these implants.*

Today's clinical standards for surface treatment of dental implants are showing a wide spread of surface roughness. Generally the differentiation follows three major structures:

**Summary:**

Sa < 1 micron – Lower roughness

Shorter period of osseointegration with less load capability

Sa > 1-2 microns – Moderate roughness

Good relation between period of osseointegration and load capability

Sa > 2 microns – Deep roughness

Elongated period of osseointegration with good load capability

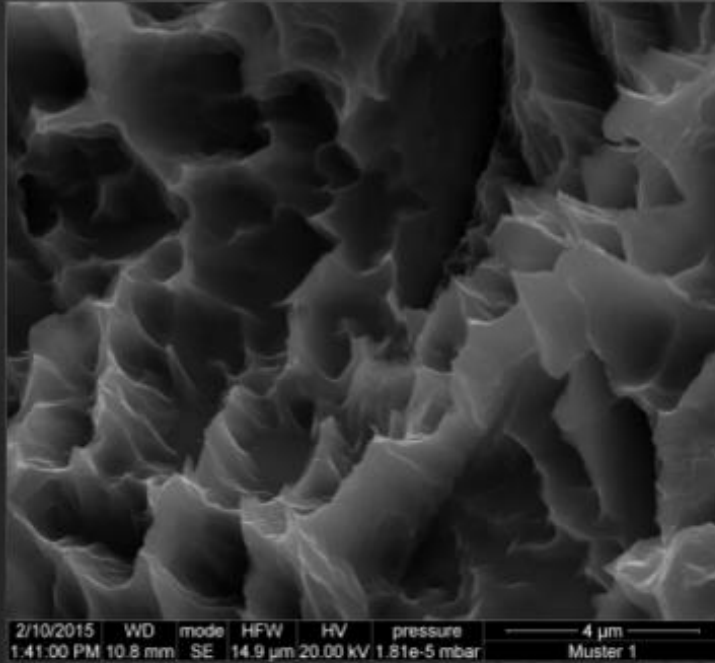
## Shot peening Process:

- Zirconium oxide beads taking care for a homogenous conditioning process of the implant surface
- Shot peening procedure doesn't influence the geometry of the titanium parts
- No residuals of process media after shot peening process



## Etching process:

- Surface treatment for an optimized topography according to clinical standards

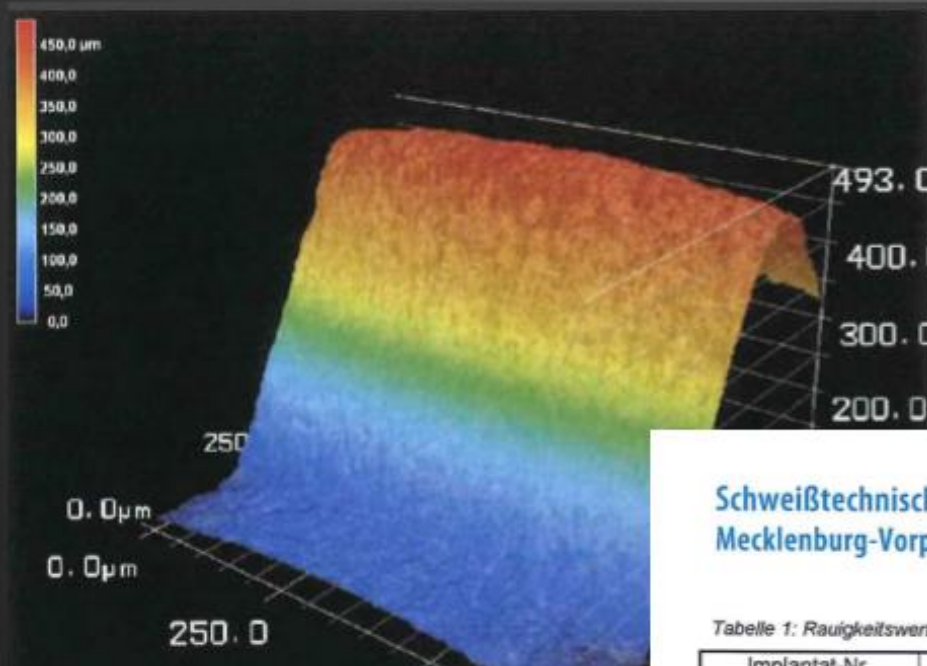


Effects of titanium surface topography on bone integration: „A *systematic review*“



Moderately rough surfaces ( $S_a > 1-2$  microns) show stronger bone responses than rough surfaces ( $S_a > 2$  microns), or less rough surfaces ( $S_a < 1$  micron)

## Surface topography:



Measurement of vertical surface topography by confocal microscopy (Sa > 1-2 microns)

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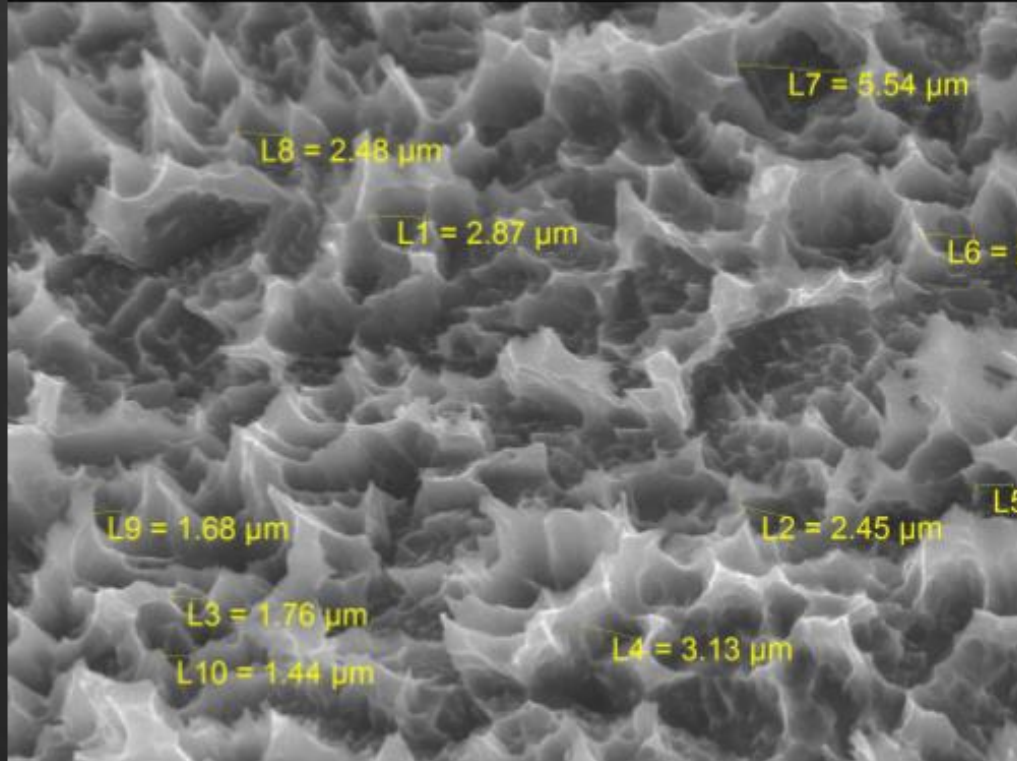
Tabelle 1: Rauigkeitswerte 0652/15

Implantat-Nr.	Sz in μm	Sa in μm	Sq in μm
1	25,75	1,43	1,87
2	20,32	1,36	1,80
3	19,33	1,34	1,73





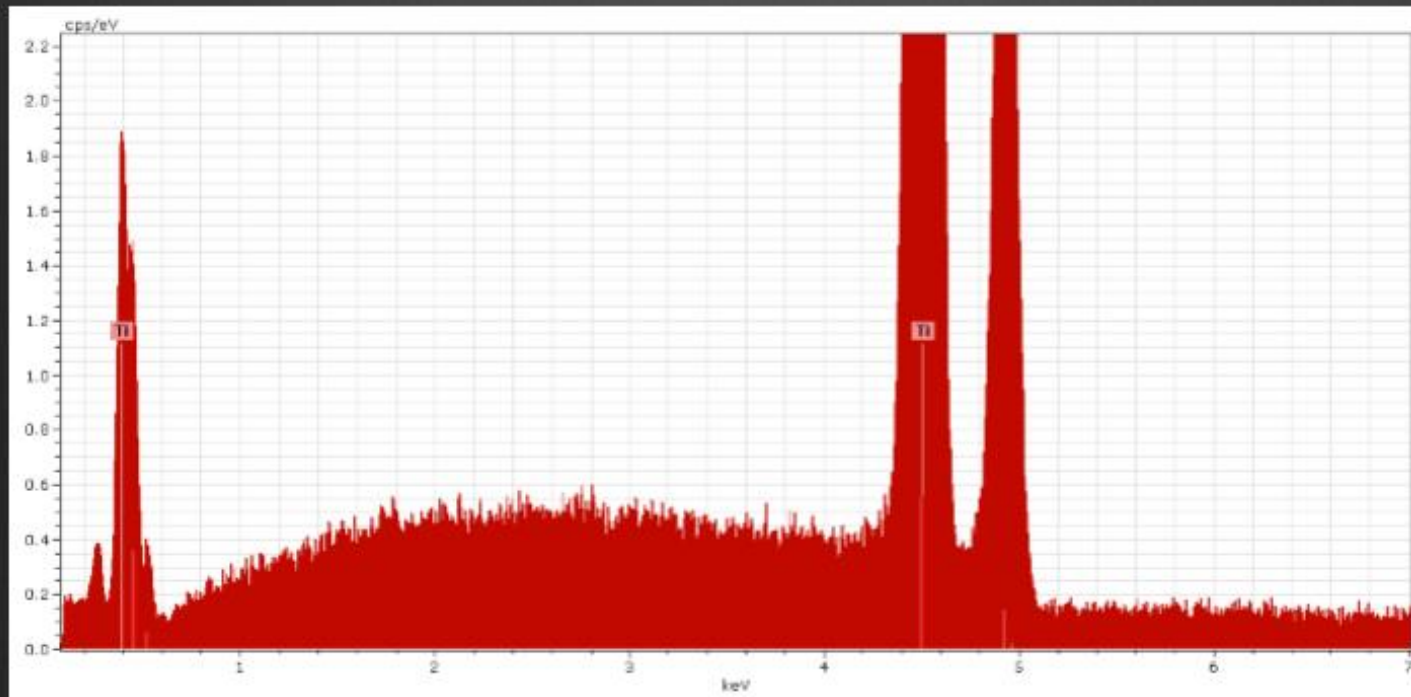
## Surface topography:



Horizontal surface measurement by SEM for detection of the size of surface lacunas

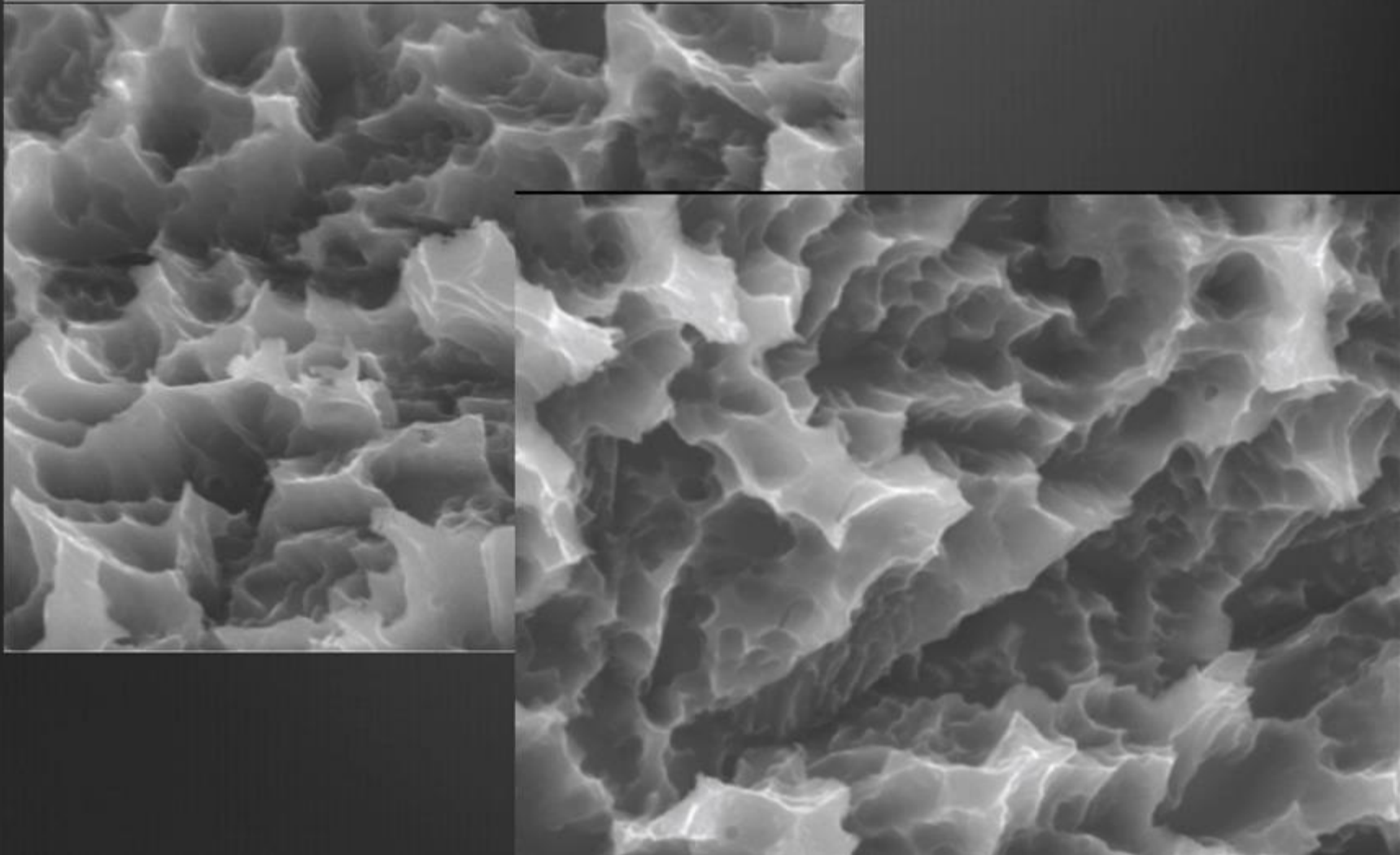
## Final EDX Analysis:

- pure titanium without residuals of process media



Final SEM Analysis:

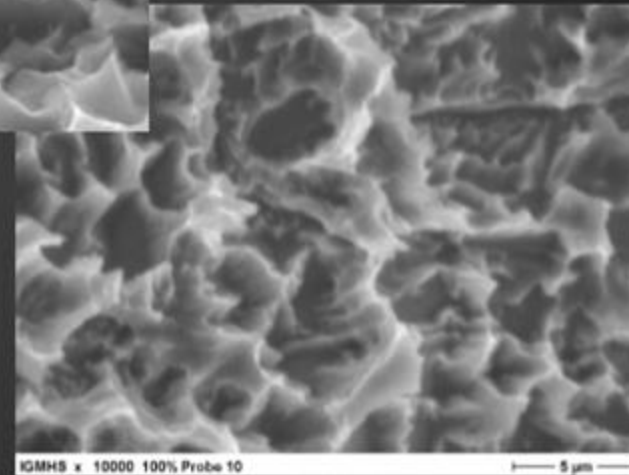
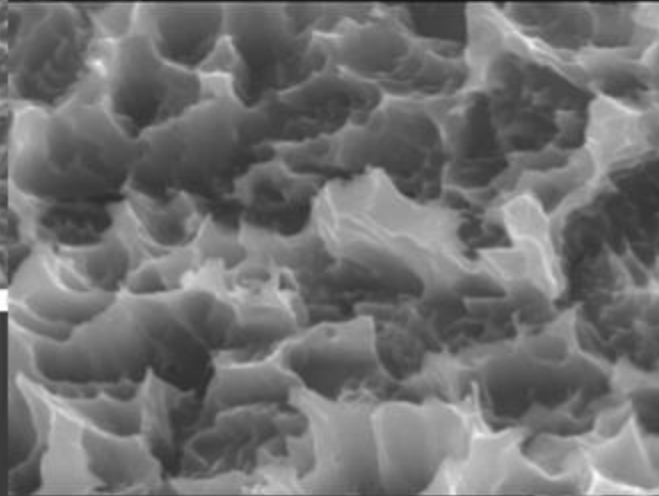
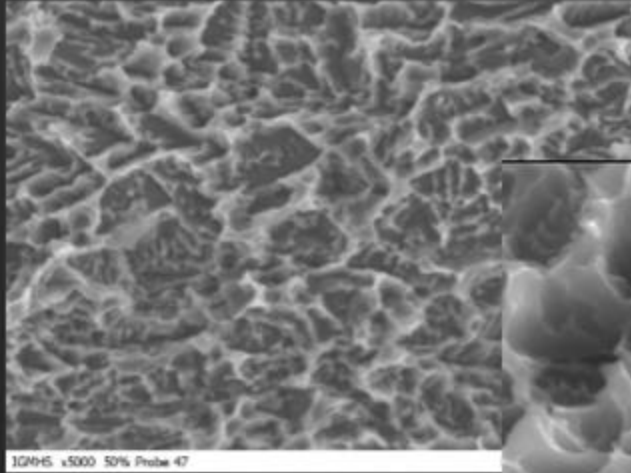
Optical analysis to evaluate the homogeneity of the surface over the complete implant geometry





## Final SEM Analysis:

Optical analysis to evaluate the homogeneity of the surface over the complete implant geometry



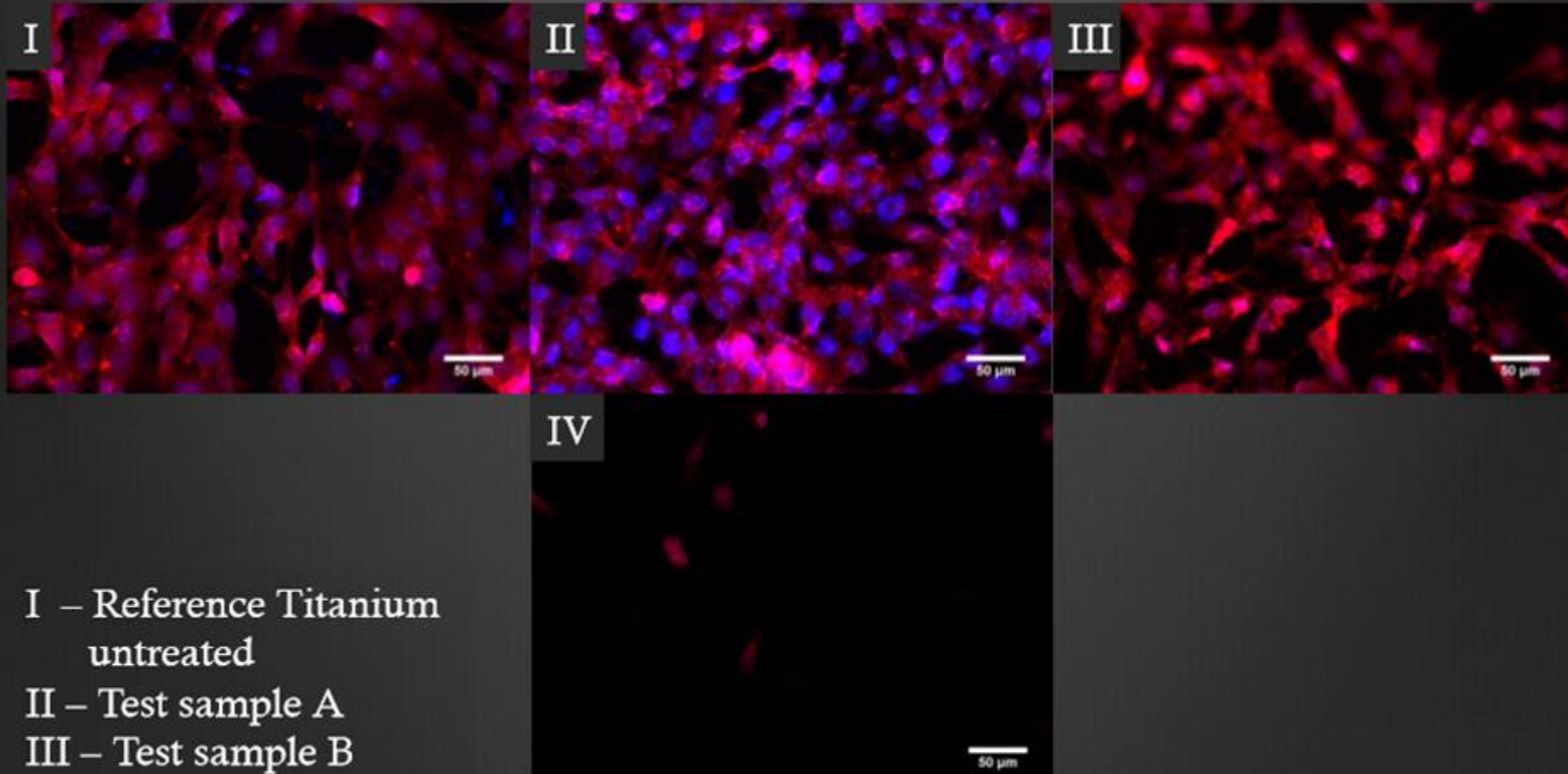
## Comparison of the Dental-Implant-Surface from Servo-Dental with competitive surfaces

Two different types of implant surfaces have been tested with cells of type MG-63.

The aim of this test was the evaluation of qualitative and quantitative analysis to figure out the biocompatibility of these two different implant surfaces.

# MG-63 on Dental implants

## 200x magnification



I – Reference Titanium  
untreated

II – Test sample A

III – Test sample B

IV – Cells on reference with HEMA (test sample with a high cytotoxic effect)

# MG-63 on dental implant surfaces (magnification 200x)

## **Explanation of pictures I – IV:**

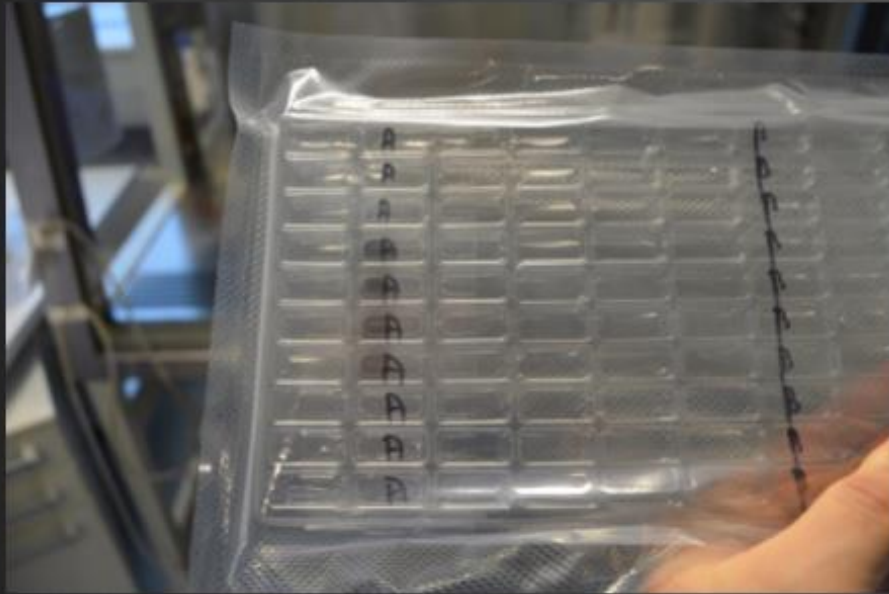
After incubation the cells will be coloured with a special dyer. The different intensities of colouration are caused by the different surface topography and the associated positions of the cells.

The visualization has to be done by a fluorescence microscope. The samples are not transparent so they couldn't be captured by a usual light microscope.

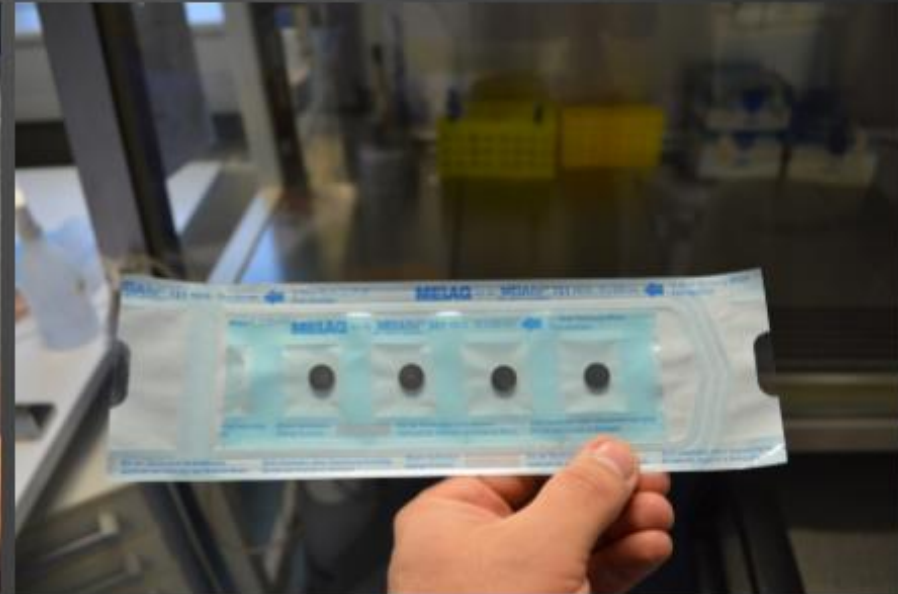


# Test samples

Test sample A



Test sample B





# MG-63 on dental implant surfaces (magnification 200x)

## Explanation of pictures I – IV:

**Sample I:** This is a flat, non modified surface from a commercial medical degree titanium which is the negative control.

Negative control means, that these samples from titanium are biocompatible as shown by different tests.

So these samples couldn't show a negative effect on the used cells.

# MG-63 on dental implant surfaces (magnification 200x)

## Explanation of pictures I – IV:

**Samples II + III:** These samples are made from surface modified commercial medical degree titanium.

The different colour intensities of the cells are also caused by the the surface topography.

Both surfaces have shown a biocompatibility.

Surface sample II (Sample set A = sample of Servo-Dental) shows advantages in comparison to Surface sample III (Sample set B = sample of the competitor).

# MG-63 on dental implant surfaces (magnification 200x)

## Explanation of pictures I – IV:

**Sample IV:** This sample shows the positive control which should show a scheduled negative effect on the biocompatibility. Therefore the samples were covered with „HEMA“ (2-Hydroxyethyl methacrylate). This causes a targeted cell death.

This effect shows a good differentiation by the lower colourization effect of the cells.

# MG-63 before and after Extraction A

1 – NK before Extracting test

2 – NK after 24 h Extracting test

3 – A before Extracting test

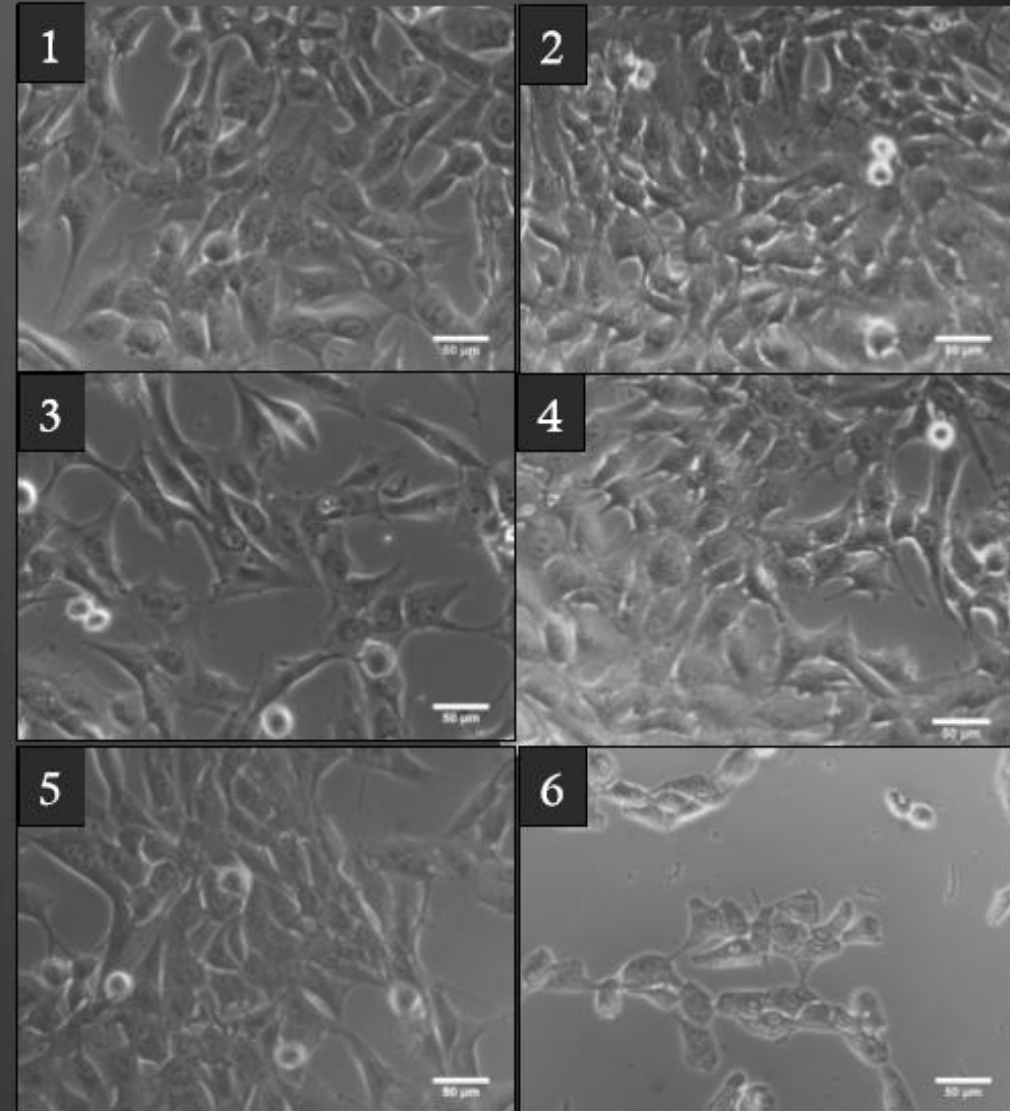
4 – A after 24 h Extracting test

5 – PK before Extracting test

6 – PK after 24 h Extracting test  
10% HEMA

NK = Negative control

PK = Positive control



## MG-63 before and after extraction A (Sample set of Servo-Dental)

Pictures 1-6 shows the SEM-pictures (Scanning-Electron-Microscopy) of the cell proliferation after 24h in a direct comparison to the positive- / and negative control sample.



# MG-63 before and after Extraction B

7 – NK before Extracting test

8 – NK after 24 h Extracting test

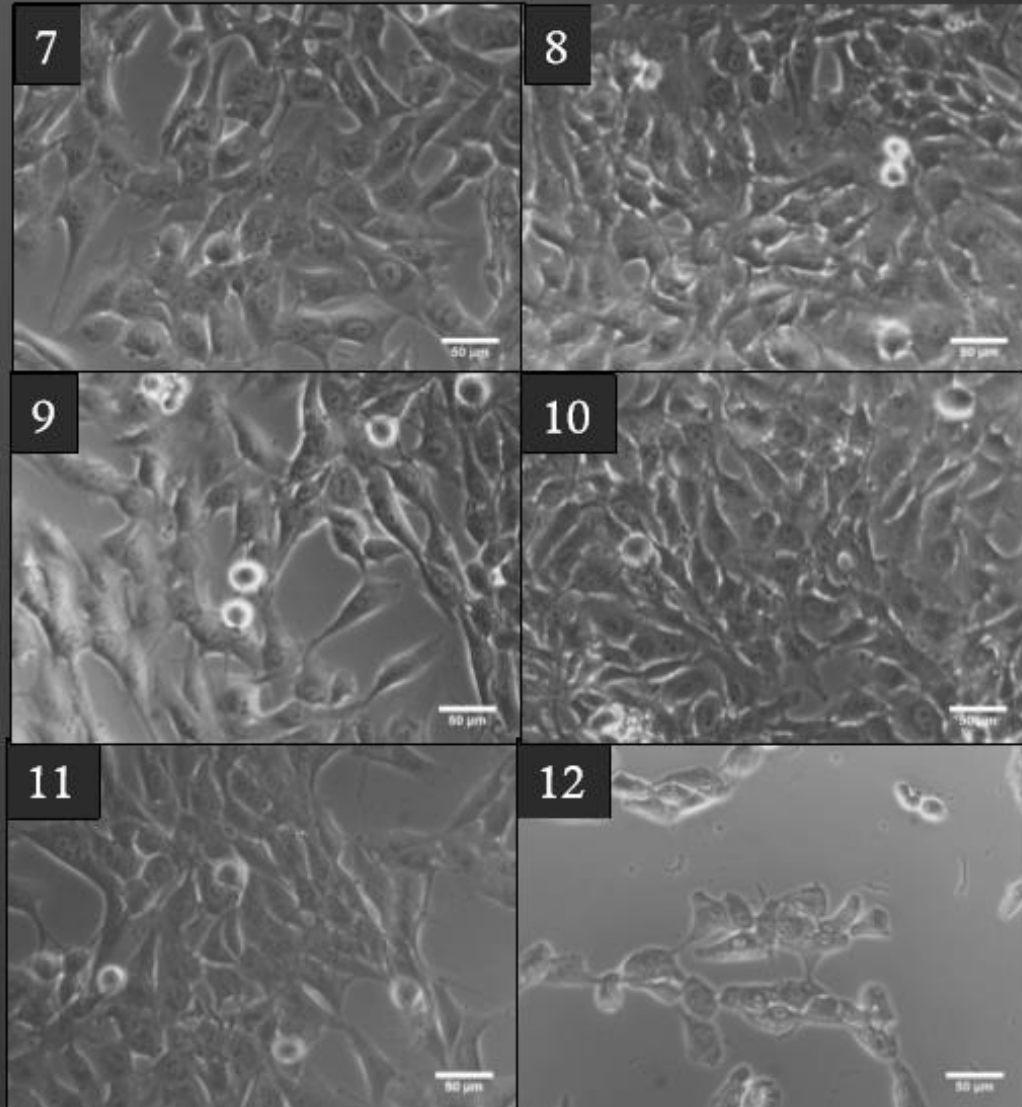
9 – B before Extracting test

10 – B after 24 h Extracting test

11 – PK before Extracting test

12 – PK after 24 h  
Extracting test  
10% HEMA

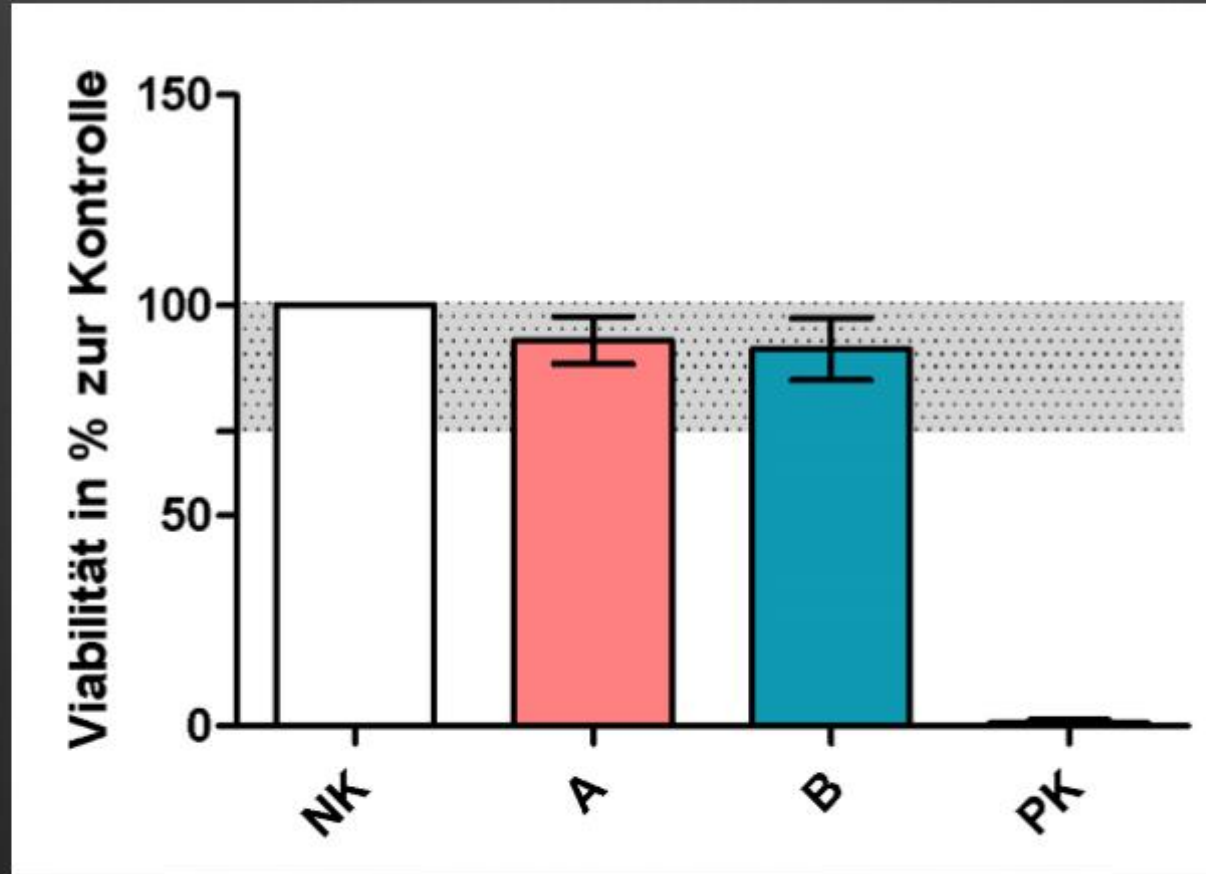
NK = Negative control  
PK = Positive control



## MG-63 before and after extraction B (Sample set of the competitor)

Pictures 7-12 shows the SEM-pictures (Scanning-Electron-Microskopy) of the cell proliferation after 24h in a direct comparison to the positive-/ and negative control sample.

# Biokompatibilität WST according to DIN EN ISO 10993



Biocompatibility according to DIN EN ISO 10993 grey marked area shows the level which is defined as biocompatibel (70-100%)