

Hard Ti Based Coatings for Implants

Background:

Titanium and its alloys show excellent biocompatibility, but the mechanical surface properties are not satisfying.

Objective:

Are the hard coatings TiN and TiAlN candidates for bone integrated implants?

Method for Coating:

Plasma Immersion Ion Implantation and Deposition

Method:

Bone marrow cells were seeded out on these coatings using medium with serum or without serum.

After 6 hours:

- Lactat dehydrogenase in the supernatant as indicator for cytotoxicity
- Stain for adhesion proteins and cytoskeleton to see the cell adhesion

After 14 days:

- MTT assay as marker for cell metabolism
- Alkaline phosphatase as marker for osteoblast differentiation.

Results:

- ✓ There was no difference in cell behaviour when using medium with serum.
- ✓ Either with or without serum there was no sign of cytotoxic cell death.
- ✓ Without serum cells adhere best on coatings produced with bias voltage. Under these conditions TiAlN performed best (Fig. 1)
- ✓ After two weeks good metabolism and osteoblastic differentiation was found. (Fig. 2)

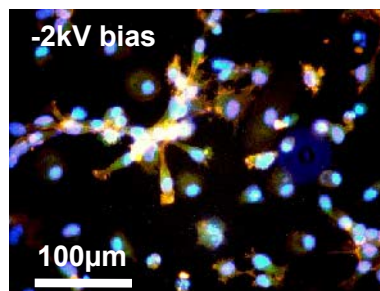
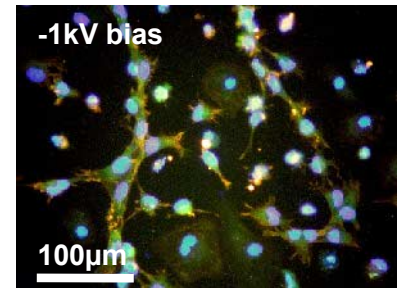
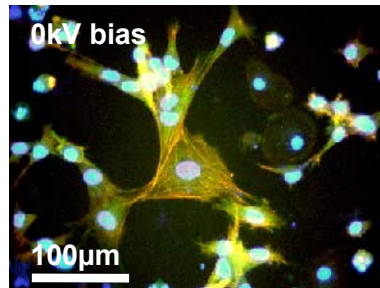


Fig 1:

Cell adhesion on TiAlN coatings. Cells adhere best on coatings produced without bias voltage.

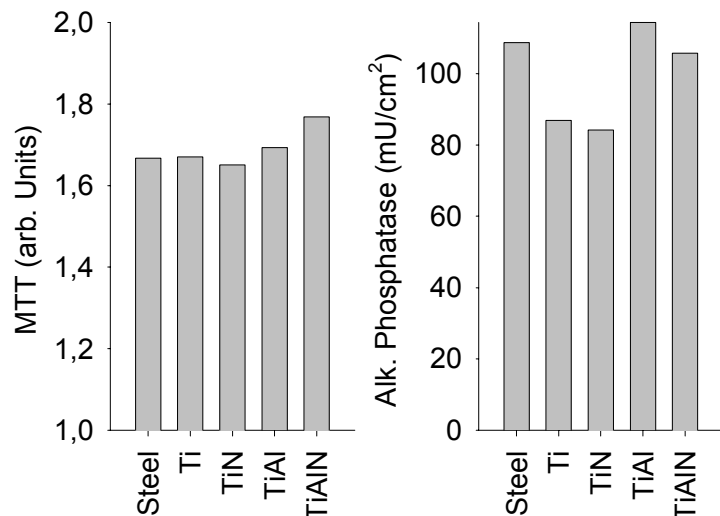


Fig 2: Good metabolic activity (left) and osteoblastic differentiation (right) on TiN and TiAlN coatings.

Conclusion:

The hard coatings TiN and TiAlN are biocompatible and principally can be used as implant coating. The deposition parameters for optimal growth of bone forming cells must be specified.