SPECTROSCOPIC ELLIPSOMETRY OF ADSORBED PROTEINS ON BIOCERAMIC IMPLANT MATERIAL

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Ceramic materials like zirconium oxide have gained increased interest as a biomaterial for dental implants. They provide not only better aesthetical properties but also an improved biocompatibility and a mechanical strength comparable to standard titanium implants. Bioceramics do not oxidize or corrode, giving them an advantage over metal implants. There are many factors, like material surface characteristics, protein adsorption, cell adhesion and type of surrounding tissue, influencing the interaction at the biointerface between a biological system and a material surface.

The primary adhesion of proteins, e.g. from the blood of the patient, is crucial for cell attachment and an associated problem-free integration of the implant in the body. To date, there are only a few immunological, standardized diagnostic tests so that the extent of a clinically acute immune reaction cannot be estimated sufficiently, especially with regard to innovate implant materials.

We present results on a work-in-progress Ellipsometry investigation about the adsorption of serum albumin, a typical blood protein, on zirconium oxide. Our aim is to investigate the protein adsorption on polished (Ra=0.01µm) zirconium oxide by means of thickness measurement of the protein layer. Even with the polishing there still remains a roughness influencing the protein adsorption (Figure 1) which is important to know to correctly evaluate the amount of adsorbed proteins on the ceramic.

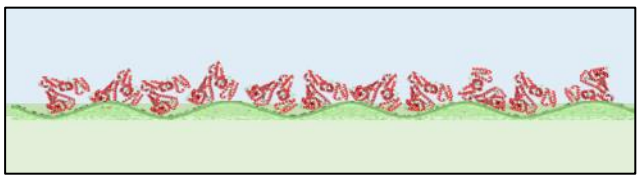

Fig. 1. Modell of adsorbed BSA on zirconium oxide

We used a liquid cell for the in-situ Spectroscopic Ellipsometry (240-900nm) to analyse the optical and structural properties of the protein layer and the zirconium oxide roughness. For a first approach the influence of the pH-value has been studied under various buffer conditions. The adsorbed protein layers were measured after 1h incubation of the material in the corresponding protein solution.

By determining the thickness of the protein layer we were able to quantify the amount of the adsorbed protein on the polished zirconium oxide.

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Keywords: Protein adsorption, serum albumin, liquid cell; bioceramic