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**Cyclic Deformation Behaviour of Surface Modified Titanium Implant Alloys in Simulated Physiological Media**

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**Abstract**

In the human body, load bearing implants are subjected to a complex interaction of mechanical and biological-chemical loading. Because of their rather unique combination of mechanical, chemical and biological properties, titanium and its alloys are widely used as materials for surgical implants. In order to improve the bioadhesion and the corrosion behaviour, the surfaces of titanium implants are often modified, for example by surface roughening, oxidation or coating techniques. These surface treatments can influence the mechanical properties of the implant. In this investigation, the cyclic deformation behaviour of the titanium alloys, cp-Ti, Ti-6Al-4V and Ti-6Al-7Nb was characterised in axial stress controlled constant amplitude and load increase tests as well as in rotating bending tests. The influence of different clinically relevant surface treatments (mechanical polishing, corundum grit blasting, thermal and anodic oxidising) on the fatigue behaviour was investigated. All tests were realised in simulated physiological media. The cyclic deformation behaviour was characterised by mechanical hysteresis measurements. Surface damages were detected and characterised by corrosion potential, corrosion current and impedance measurement. The feasibility of the electrochemical techniques was demonstrated in scratch tests. In addition, the influence of different media compositions on the corrosion and repassivation behaviour of the titanium alloys was examined.

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