ELECTROCHEMICAL BEHAVIOUR OF NITI

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Near equiatomic nickel-titanium (Nitinol) is characterized by a unique combination of properties, including superelasticity and shape memory effect that makes it very attractive for biomedical applications, such as orthopaedic implants, self-expanding stents or orthodontics applications. Due to these properties, the material has the ability to return to a previously defined shape or size when subjected to an appropriate stress or thermal procedure, thus allowing a constant stress to be applied, *e.g.* for a more stable fixation of fractures.

The primary concern about Nitinol is the high nickel content and its possible influence on biocompatibility. In fact, nickel may generate allergenic, toxic and carcinogenic effects. On the other hand, conflicting views regarding the corrosion resistance of Nitinol, and therefore nickel ions release, have been found in the literature.

In the present work, the corrosion behaviour of NiTi in Hank's solution at 37ºC was assessed by the use of electrochemical methods. Pure titanium and pure nickel were included in the study in order to understand the contribution of each alloying element. The results were compared with Ti 6Al 4V alloy and 316L stainless steel, materials traditionally used as orthopaedics implants. Moreover, the susceptibility of NiTi to corrosion under different conditions was examined using different physiological solutions and different pH values.

It was observed that the corrosion behaviour of NiTi is much closer to Ti than to Ni, as may be seen on the polarization curve results, where the high protective character of the passive oxide film formed on NiTi is similar to that of titanium. On the other hand, comparing the different implant materials it was possible to establish the following relation for their corrosion resistances: 316L stainless steel < NiTi < Ti-6Al-4V.

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