CORROSION BEHAVIOUR OF NiTi ALLOY IN HANK'S SOLUTION

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Nitinol is a nickel-titanium nearly equiatomic alloy that has been attracting considerable interest for biomedical applications due to its shape memory and superelastic properties and biocompatibility. However, due to the high nickel content of the alloy and as this element may induce allergic response, the material should present superior corrosion resistance in contact with body fluids. Although several studies have been preformed on the corrosion performance of Nitinol when in contact with physiological media, there is a lack of reproducibility in the reported results and no information is available on the characterization of the material in dynamic conditions or after being deformed. In the present work, the electrochemical behaviour of NiTi has been studied in Hank's solution at 370C to simulate body conditions. The same study has been made on pure titanium and nickel in order to understand the contribution of each alloying element on the NiTi behaviour. 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. The same conclusions were obtained using capacitance measurements (Mott-Shottky approach). An equivalent circuit was proposed to fit the impedance spectra of NiTi and electrochemical parameters were estimated to characterize its natural passive oxide film. XPS analysis established that both oxidized Ti and Ni can be found on the surface of polished NiTi alloy.