INFLUENCE OF ORAL ACIDITY AND TEMPERATURE BEHAVIOR OF VARIOUS ORTHODONTIC WIRES IN ARTIFICIAL SALIVA

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Abstract
The sophisticated and highly variable, in terms of pH, electrolyte availability and temperature environment of the oral cavity can cause various biomaterials used in oral medicine to release metal ions due to corrosion phenomena. Thus, materials used in dental applications must be biocompatible and offer a solid resistance towards corrosive leakage over a wide range of pH and temperature values.

The present study aims to assess the corrosion resistance of chromium - nickel as compared to chromium - manganese commercially available orthodontic wires in artificial saliva. The two investigated wire samples have been studied by means of various electrochemical techniques like cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), linear polarization (LV), as well as by employing chronoelectrochemical studies (chronoamperometry - CA and chronopotentiometry - CP). The afore mentioned procedures have been successfully applied in the investigation of various corrosion processes involving dental alloys. We used Fusayama artificial saliva solution as corrosive electrolyte during the electrochemical tests. While the solution pH varied in discrete steps between 3.5 and 7.5, the temperature was also modified between 27 and 47 ºC for each pH value, to most closely simulate real-life conditions of metal-electrolyte contact. Sample analysis by scanning electron microscopy (SEM) before and after each corrosion test has been performed in order to inspect potential modifications of the surface morphologies. Allergen and nickel free Cr-Mn biomaterials, exhibited good corrosion resistance, representing a good alternative to the widely used Cr-Ni alloy based orthodontic wires.

Keywords: Cr-Ni, Cr-Mn orthodontic wires; corrosion resistance; electrochemical behaviour; biomaterials.

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