The corrosion resistance of two non-noble dental alloys

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Nickel-chromium and cobalt-chromium alloys are commonly used for crown and bridge castings. These non-noble dental alloys are much cheaper than noble dental alloys but on the other hand they have disadvantages related to their lower corrosion resistance and corrosion products (relaeased ions), some of them recognized as toxic ions that may cause allergies and other oral pathologies. Therefore it is important to evaluate the corrosion behaviour of such alloys.

This study aims to evaluate the electrochemical corrosion behaviour of two non-noble dental alloys *per si* and when coupled to an amalgam (Dispersalloy®). The study was conducted in artificial saliva, pH 7.1, at 37 °C, by linear sweep voltammetry, electrochemical impedance spectroscopy and chronoamperometry. The *R*p values of the three non-noble dental alloys lie in the range of 10^3 to 10^4 Ω cm^2. Data from E_{ocp} curves, linear polarization resistance, Tafel plots and electrochemical impedance spectroscopy lead to the same order for the resistance against corrosion of the three non-noble dental alloys in artificial saliva.

Values of the i_{couple} of 1.0 and 1.1 μA cm^{-2} and of the E_{couple} -0.121 and -0.177 V *vs.* Ag|AgCl, respectively, were obtained for the two non-noble alloys when coupled to the Dispersalloy®. The amount of ions released into the artificial saliva, during 25 days was measured by inductively coupled plasma atomic emission spectrometry (ICP–AES) and the surface morphology and composition of the samples was observed by scanning electron microscopy coupled to energy dispersive spectroscopy (SEM-EDS). The electrochemical behaviour of the alloys object of this study will be compared with that of the noble alloys, already studied by the authors, under identical experimental conditions [1].

[1] C. Solá, A. Amorim, Á. Espías, S. Capelo, J. Fernandes, L. Proença, L. Sanchez, I. Fonseca, Int. J. Electrochem. Sci., 7 (2013) 406 - 420