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Electrochemical and biological characterization of Ti-15Zr-15Mo-Ag alloys for potential use as biofunctional implants

Torrento, J.E.M.(1); Grandini, C.R.(1); Almeida, G.S.(1); Zambuzzi, W.F.(1); Correa, D.R.N.(2);
(1) UNESP; (2) IFSP;

Titanium and its alloys are widely used as dental and orthopedical implants, because of their good biocompatibility and mechanical properties. The mechanical properties and microstructure of titanium can be changed by adding alloying elements, such as zirconium and molybdenum. Silver is an alloying element recognized for its antibacterial action, which can improve mechanical strength and decrease the elastic modulus of titanium. Also, surface modifications are often applied on Ti surfaces, enhancing the interaction between the metal and the biological host and favoring the osseointegration process. This study aims to investigate the potential use of Ti-15Zr-15Mo-(1 and 3 wt%)Ag alloys as biomaterials. The ingots were produced by argon arc melting and subsequently subjected to thermomechanical treatments. The samples were characterized by MTT and violet crystal cytotoxicity and corrosion tests of open circuit potential (OCP), potentiodynamic polarization (PP), and electrochemical impedance spectroscopy (EIS). The electrochemical and MTT tests indicated excellent cell adhesion and cell viability, and good corrosion resistance, better than the commercial biomaterials, Ti-CP, Ti-6Al-4V, and stainless steel 326L. The good biological response combined with corrosion resistance favors the usage of the material in the body for long-term, avoiding failures and repair surgeries. The sample presented previews a good combination of electrochemical and biological properties, showing great potential for use as a biofunctional and bioactive biomaterial. (Financial support: FAPESP, CNPq, and CAPES)