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# Electrochemical response in biological media of Plasma Electrolytic Oxidation treated Additively Manufactured Ti6Al4V alloy

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**Abstracts:** Innovative 3D metal Additive Manufacturing (AM) techniques are revolutionizing the biomedical industry since they enable the production of porous structures and patient-customized parts of biomedical-grade materials, such as Ti alloys. Surface treatment via plasma electrolytic oxidation (PEO) of conventionally manufactured Ti and its alloys has been proved an outstanding approach to promote the osseointegration of implants. Henceforth, it is of increasing interest to develop PEO treatments for AM Ti alloys.

The objective of the present work was to fabricate Ca and P containing thin (~ 3 - 10 μm thickness) PEO coatings on a Ti6Al4V alloy manufactured via Direct Metal Laser Sintering (DMLS), a laser powder bed fusion AM technique, and to study the electrochemical behavior of the treated specimens in a modified $\alpha$-MEM solution. The electrical response of PEO process on the AM alloy was compared to the one on wrought mill-annealed Ti6Al4V sheets. The electrochemical behavior of the PEO treated AM alloy was evaluated via potendiodynamic polarization and electrochemical impedance spectroscopy (EIS) in comparison to the non-treated AM alloy and the PEO-treated conventional counterparts. The surface degradation morphologies were evaluated by electron-optical microscopy and optical profilometry.

The effect of the AM microstructure on the PEO process and the microstructure and electrochemical response of the resultant coatings are discussed with the aim to define future work lines relevant to the improvement of the corrosion resistance of AM Ti6Al4V, particularly to pitting corrosion.

**Keywords:** Ti6Al4V; direct metal laser sintering; plasma electrolytic oxidation; coatings