



Deposition of a PEO-coating decorated with Ta oxides on AISI 1020 for potential use as biomaterials

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SUMMARY

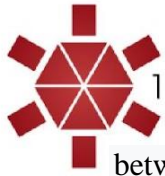
Ferrous materials, such as stainless steels, are commonly used as surgical instruments and biomaterials, due to their low cost, adequate mechanical and corrosion properties, and also to be biointert. However, its applications as biomedical implants are restricted, since their mechanical, corrosion, and biological properties are still inferior to titanium and Co-Cr alloys. As it is well known, a useful way to change the properties of metals and alloys is through surface treatments. Plasma Electrolytic Oxidation (PEO) is a surface coating that improves the wear and surface corrosion resistance, providing desirable properties for various applications [1]. Among the oxides formed by the main metallic elements, tantalum oxide (Ta_2O_5) can significantly improve the corrosion resistance and biocompatibility, in addition to including bioactive properties on the surface of metals [2,3]. This work aimed to obtain and characterize tantalum oxide coatings incorporated on carbon steel substrate using PEO treatment. The surface treatments were carried out with an alternate voltage source, with voltages of 100 V to 400 V, frequencies between 100 Hz and 1000 Hz and duty cycle

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between 10% and 60%, for times up to 10 min. The electrolyte was composed of an aqueous solution of 2 g/L of potassium hydroxide (KOH) and 10 g/L of tantalum hydroxide (TaOH). SEM/EDS results indicated that the oxide layer was porous, with some amount of Ta oxide incorporated into the coating. The XRD pattern exhibited just an amorphous phase composition, which affected the roughness and wettability values. The obtained results confirmed that the PEO treatment was a good strategy to improve the properties of the carbon steel for use as biomaterials.

REFERENCES

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