

TiO₂ Formation after Nanotubes Growth on Ti-15Mo Alloy Surface for Different Annealing Temperatures

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Abstract : Surface modification of titanium and its alloys using TiO₂ nanotube growth has been widely studied for biomedical field due to excellent interaction between implant and biological environment. The success of this treatment is directly related to anatase phase formation (TiO₂ phase) which affects the cells growth. The aim of this study was to evaluate the phases formed in the nanotubes growth on the Ti-15Mo surface. Nanotubes were grown by electrochemical anodization of the alloy in ammonium fluoride based glycerol electrolyte for 24 hours at 20V. Then, the samples were annealed at 200°, 400°, 450°, 500°, 600°, and 800° C for 1 hour. Contact angles measurements, scanning electron microscopy images and X rays diffraction analysis (XRD) were carried out for all samples. Raman Spectroscopy was used to evaluate TiO₂ phases transformation in nanotubes samples as well. The results of XRD showed anatase formation for lower temperatures, while at 800 ° C the rutile phase was observed all over the surface. Raman spectra indicate that this phase transition occurs between 500 and 600 °C. The different phases formed have influenced the nanotubes morphologies, since higher annealing temperatures induced agglutination of the TiO₂ layer, disrupting the tubular structure. On the other hand, the nanotubes drastically reduced the contact angle, regardless the annealing temperature.

Keywords : nanotubes, TiO₂, titanium alloys, Ti-15Mo

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