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Deposition of TiO2 thin films on Ti35Nb7Zr5Ta alloy using the ALD technique and DGC plasma for biomedical application

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The coating of metal alloys with titanium dioxide (TiO2) can be a differentiator of metal alloys for hip prostheses and dental implants. The high refractive index, low toxicity, good biocompatibility and corrosion resistance of this thin film offer low wear rate on articular surfaces in orthopedic applications. This work studies the deposition of TiO2 thin films on the Ti35Nb7Zr5Ta alloy using two plasma techniques: atomic layer deposition (ALD) and cathode cage deposition (CCD). After deposition, the samples were characterized by Raman scattering spectroscopy techniques, which confirmed the deposition of the films, X-ray diffractometry (XRD), which identified the crystalline phases, and scanning electron microscopy (SEM), in which the morphology was investigated. Raman spectroscopy identified the characteristic peaks of TiO2 at 143, 196, 395, 518 and 638 cm-1. XRD identified the anatase phase of TiO2 at 25.2°, 37.8°, 48° and 55°. It was concluded that the ALD technique demonstrated a more uniform film on the alloy, with parameters equivalent to those in the literature and with better properties. The CCD technique presented edge effects, in addition to displacement of peaks, probably caused by the proportion of gases and the film is visually not so uniform.