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Synthesis and Characterization of Silver/Graphene Oxide Co-Decorated TiO2 Nanotubular Arrays for Biomedical Applications

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Abstract : Recently, reports on the fabrication of nanotubular arrays have generated considerable scientific interest, owing to the broad range of applications of the oxide nanotubes in solar cells, orthopedic and dental implants, photocatalytic devices as well as lithium-ion batteries. A more attractive approach for the fabrication of oxide nanotubes with controllable morphology is the electrochemical anodization of substrate in a fluoride-containing electrolyte. Consequently, titanium dioxide nanotubes (TiO2 NTs) have been highly considered as an applicable material particularly in the district of artificial implants. In addition, regarding long-term efficacy and reasons of failing and infection after surgery of currently used dental implants required to enhance the cytocompatibility properties of Ti-based bone-like tissue. As well, graphene oxide (GO) with relevant biocompatibility features in tissue sites, osseointegration and drug delivery functionalization was fully understood. Besides, the boasting antibacterial ability of silver (Ag) remarkably provided for implantable devices without infection symptoms. Here, surface modification of Ti–6Al–7Nb implants (Ti67IMP) by the development of Ag/GO co-decorated TiO2 NTs was examined. Initially, the anodic TiO2 nanotubes obtained at a constant potential of 60 V were annealed at 600 degree centigrade for 2 h to improve the adhesion of the coating. Afterward, the Ag/GO co-decorated TiO2 NTs were developed by spin coating on Ti67IM. The microstructural features, phase composition and wettability behavior of the nanostructured coating were characterized comparably. In a nutshell, the results of the present study may contribute to the development of the nanostructured Ti67IMP with improved surface properties.

Keywords : anodic tio2 nanotube, biomedical applications, graphene oxide, silver, spin coating
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