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Effect of Ag concentration on Structural, mechanical, Antibacterial properties of Ag-TiN coatingsDejun Li¹, L Dong², J G Yu², C Li², Y P Pan², R X Wan³, H Q Gu³

¹Tianjin Normal University, Tianjin, China ²College of Physics and Materials Science, Tianjin Normal University, Tianjin, China ³Tianjin Institute of Urological Surgery, Tianjin Medical University, Tianjin, China

dli1961@126.com

Nanoscale Ag-TiN coatings were successfully deposited on medical Ti-6Al-4V substrate by multi-target magnetron co-sputtering system. In order to strengthen adhesion of Ag-TiN coatings with medical titanium alloys substrate, TiN was used as buffer-layer depositing on alloys. The titanium nitride target and the silver target were sputtered simultaneously to form Ti-N-Ag composite layers in as-deposited coatings with different components and textures. The structures, hardness, adhesion were investigated by Scanning Electron Microscope (SEM), X-ray diffraction (XRD), XP-2 Step Profiler, Nano-indentation. XRD results show the good crystallinity of silver's (111), (200) and (220) phase. At -50 V bias, the phase structure of TiN displayed desired preferred orientation of (111). The maximum hardness and elastic modulus of the Ag-TiN coating at -180 V are up to 19.2 GPa and 237.8 GPa. Antibacterial property was enhanced with Ag concentration increasing. The results show that the mechanical properties and Ag concentration of Ag-TiN coatings related to power, bias, and modulation structure. Our results indicated that the medical titanium alloys coated by Ag-TiN coatings with appropriate synthesis parameters, modulation structure, and Ag concentration can obtain good crystallinity, higher hardness, elastic modulus, and antibacterial property.

Keywords

Ag-TiN coatings
magnetron co-sputtering
Ag concentration
hardness
antibacterial property