PO4011

Reactive HiPIMS deposition of MgO thin films using peak current regulation and its in-vitro corrosion performance for medical applications

Silmina Adzhani[1], Hidetoshi Komiya[1], Ana Beatriz Chaar[2], Yoshikazu Teranishi[3], Tetsuhide Shimizu[1], Ming Yang[1]

[1]Tokyo Metropolitan University, Tokyo, Japan [2]Linköping University, Linköping, Sweden [3]TIRI, Tokyo, Japan

silmina-adzhani@ed.tmu.ac.jp

Magnesium and its alloys as a biodegradable material have great potential to be developed due to its excellent biocompatibility and similar mechanical properties to natural bone. However, poor corrosion resistance has to be improved for medical applications. In this study, MgO films were deposited by reactive high-power impulse magnetron sputtering (HiPIMS), using peak current regulation mode to realize the high-rate deposition stabilized at transition mode in reactive process. The plasma state was also characterized using voltage/current measurements and in-situ optical emission spectroscopy (OES). The chemical composition, surface morphology and phase composition of the films were analyzed by electron dispersion X-ray spectroscopy (EDX), scanning electron microscopy (SEM) and X-ray diffraction (XRD), respectively. As results, stoichiometric composition and good crystallinity of MgO (2,2,0) films were successfully deposited with high deposition rate of approximately 27 nm/min, under the reactive condition of O_2 and Ar gas mixtures at the working pressure of 1 Pa under 24 A peak current regulation. Further investigation on the in-vitro corrosion behaviors of MgO films were conducted by immersion test in Hanks' balanced salt solution (HBSS) and electrochemical measurements. Improvement in corrosion resistivity by the HiPIMS deposited MgO film were successfully demonstrated.

Keywords
HiPIMS
MgO
Reactive sputtering
Peak current regulation
In-vitro corrosion