OR1804

Chopped HiPIMS deposition of metallic titanium films

Jörg Patscheider[1], Kerstin Thorwarth[1], SuBong Jin[2], Clara Barker[3], Sven Gauter[4]

[1]Empa, Dübendorf, Switzerland [2]CAPST, Sungkyunkwan University, Suwon, South Korea [3]Department of Materials, Oxford University, Oxford, United Kingdom [4]Institut für Experimentelle und Angewandte Physik, University of Kiel, Kiel, Germany

joerg.patscheider@empa.ch

Metallic titanium films have many attractive applications, e.g. in biomedical applications, as they allow for the metallization of polymer substrates. The coating of polymeric implants by plasma spraying techniques, which are presently the standard techniques in orthopaedic implants, lead to a high thermal load of the substrates' surface and thereby to the loss of surface structural feature, which is an undesired situation.
In this work Ti coatings were deposited by chopped HiPIMS, a technique where HiPIMS pulses are decomposed into a sequence of short micropulses. The combination of these pulse trains distinctly influence the properties of titanium coatings prepared by this technique. The plasma was characterized using voltage/current measurements, optical emission spectroscopy and Langmuir probing, along with caloric measurements during deposition. The prepared coatings were examined using X-ray diffraction, scanning electron microscopy and X-ray photoelectron spectroscopy. It is shown that the pulse sequence is decisive for the applicability of Ti coatings on polymeric substrates, as it strongly influences properties such as process stability, deposition rate, morphology and thermal load during deposition, which can be improved with respect to standard HiPIMS and DC sputter deposition. The coatings' microstructure shows increased smoothening of the coating surface and shallower surface oxidation for samples deposited using chopped HiPIMS.

Keywords
HiPIMS
titanium