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Metallic film modification through the use of non-standard HiPIMS waveforms.Paul Barker¹, Erik Lewin¹, Jörg Patscheider¹¹EMPA, Dübendorf, Switzerland

paul.barker@empa.ch

High power impulse magnetron sputtering, HiPIMS, technology has been the source of significant scientific interest in recent years. HiPIMS consists of a high voltage / high current pulse, often in the region of 50 - 400 μ s, followed by a long off-period resulting in low duty cycles, generally below 10 %. Tailoring of film properties has been shown in numerous literature sources due to a significant increase in the ion-to-atom ratio generated in comparison to standard direct current magnetron sputtering, dcMS. In the present study additional control parameters are explored by using non-standard HiPIMS waveforms, consisting of pulse sequences. These pulse sequences consist of a number of micro-pulses, which can be varied in length. In this manner, the approach may be seen as a hybrid of classic HiPIMS and the emerging MPP technique. Films have been grown using these pulse sequences and compared to materials grown both by traditional, single pulse, HiPIMS and also dcMS.

The deposition of Ti metal was chosen as a model system, and the attained coatings were analysed using X-ray diffraction, XRD, scanning electron microscopy, SEM, and X-ray photoelectron spectroscopy, XPS. An increased deposition rate, relative to a comparable standard HiPIMS pulse, was observed. The coating microstructures show signs of modification, with an increased smoothening of the coating surface and shallower surface oxidation for samples deposited using micro-pulsed HiPIMS.

Keywords

HiPIMS

Process

Coatings

Titanium