Influence of Nitrogen Flow Rate in Reducing Tin Microdroplets on Biomedical TI-13ZR-13NB Alloy

A.Shah[a], S. Izman[b], M. A. Hassan[c]

[a]Faculty of Technical and Vocational Education, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

[b]Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

[c]Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26300 Pekan, Pahang, Malaysia

ABSTRACT

Cathodic arc physical vapor deposition (CAPVD) is one of the promising techniques that have a potential to coat titanium nitride (TiN) on biomedical implants due to its good adhesion and high evaporation rate. However, this method emits microdroplets which have the possible detrimental effect on the coating performance. Past studies indicated that micro droplets can be controlled through proper deposition parameters. In the present work, an attempt was made to study the effect of nitrogen gas flow rates (100 to 300 sccm) on TiN coating of the Ti-13Zr-13Nb biomedical alloy. Scanning electron microscopy (SEM) was used to evaluate surface morphology and coating thickness while crystal phase of the coated substrates was determined using X-Ray Diffraction (XRD). Image analysis software was employed to quantify microdroplets counts. Results show that higher nitrogen gas flow rate able to decrease a significant amount of microdroplets and concurrently increase the thickness of TiN coating. A mixed crystal planes of (111) and (220) are obtained on the coated substrates at this setting which exhibits denser structure with higher adhesion strength as compared to substrates coated at the lower N2 gas flow rate.

KEYWORDS: Microdroplets, CAPVD, TiN, Ti-13Zr-13Nb, N2 gas flow rate

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