Elemental Diffusion Behaviour of Biomedical Grade Titanium Alloy Through Thermal Oxidation

Mahmood Anwar[1,a], S. Izman[2,b*], Mohammed Rafiq Abdul-Kadir [3,c], E. M. Nazim[2,d], Aini Abdul Kadir[2,e], M. Konneh[4,f] and M.A. Hassan [5,g]

[1]Department of Mechanical Engineering, Curtin University, 98009 Miri, Sarawak, Malaysia

[2]Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia

[3]Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia

[4]Kulliyah of Engineering, International Islamic University, 50728 Kuala Lumpur, Malaysia

[5]Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

Email: [a]mahmood.a@curtin.edu.my,[b]izman@mail.fkm.utm.my, [c]rafiq@biomedical.utm.my, [d]nazim@fkm.utm.my,[e]aini@mail.fkm.utm.my [f]mkonneh@iium.edu.my, [g]masszee@ump.edu.my

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Abstract: Major issues related to implant failure are wear debris and metal ions release where Titanium-Aluminium-Niobium alloys still face those problems despite of better biocompatibility. Surface modification is one of the alternatives in order to reduce those wear as well as ion release problems to the host tissue. In this study, experiments were carried out to investigate the element diffusion behaviour of Ti-6Al-7Nb alloy through thermal oxidation in order to obtain coating on the surfaces for diminishing those effects. Thermal oxidation was carried out at 650^{o}C for three different durations 6, 12 and 24 hours. It is found that at prolong time, Niobium diffusion occurs where short duration Aluminium dominates. This suggests that longer heating time promotes heavy metal diffusion by restricting diffusion of light metal and hence, dominates the heavy metal oxide layer formation. The oxide layer formed on the substrate may lead to increase the lifespan of the implant and reduces the harmful effects caused by wear debris or toxic ion from metal alloys.