7th KMM-VIN Industrial Workshop

Biomaterials: Key Technologies for Better Healthcare

Programme and Abstracts

Institute of Biomaterials
FAU Erlangen-Nuremberg

InnoPlanT/Medical Valley Centre

FORM Laboratory-UK Erlangen

European Virtual Institute on Knowledge-based Multifunctional Materials KMM-VIN AISBL

27th-28th September 2017
Erlangen, Germany

Biomaterials Erlangen

MEDICAL VALLEY
INNOPLANT.NET

FORM Forschungslabor Orthopädie für Radiostereoanalyse und Medizintechnik

FAU Friedrich-Alexander Universität Erlangen-Nürnberg

KMM.VIN

Evaluation of mechanical properties and biocompatibility of Gum Metal for implant applications

Karol M. Golasiński[1]*, Elżbieta Pieczyska[1], Rainer Detsch[2], Aldo R. Boccaccini[2], and Naohisa Takesue[3]

[1] *Institute of Fundamental Technological Research, Polish Academy of Sciences, Pawińskiego 5B, 02-106 Warsaw, Poland*

[2] *Institute of Biomaterials, Friedrich-Alexander University of Erlangen-Nürnberg, Cauerstraße 6, 91058 Erlangen, Germany*

[3] *Department of Applied Physics, Graduate School of Science, Fukuoka University, Nanakuma, Jonan-ku, Fukuoka 814-0180, Japan*

**kgolasin@ippt.pan.pl*

Titanium and titanium alloys are widely applied as materials for orthopedic and dental implants. However currently, a great limitation of these materials is their high Young's modulus (over 100 GPa) which often leads to bone-shielding effect. Another drawback of certain Ti-based alloys is a content of cytotoxic elements; for example of Al and V in Ti-6Al-4V (ELI). That is why, for the last decades a major effort has been put to develop a Ti-based material with lower Young's modulus and negligible toxicity.

In this work, mechanical properties of a β-Ti alloy Gum Metal (Ti–23Nb–0.7Ta–2.0Zr–1.2O at.%, free of cytotoxic content), which was fabricated at Toyota Central Research & Development Laboratories, Inc., were investigated. It was confirmed that Gum Metal is characterized by a low Young's modulus (around 60 GPa), high strength (over 1000 MPa) and a large range of reversible deformation, which are important features in the context of potential implant applications. Moreover, a comprehensive assessment of biocompatibility was realized. Properties of Gum Metal were contrasted with those of Ti-6Al-4V (ELI) which was taken as reference. Surface conditions, such as topography, roughness and structural composition, were analyzed. Evaluation of biocompatibility for the alloys was performed by cell attachment and spreading analysis after predefined cell culture periods. Gum Metal presented excellent properties, what makes it a good candidate for implant applications.

Acknowledgements

The research has been supported by the KMM-VIN Research Fellowship (Call 9) and the Polish National Science Centre (NCN) under Grants nos. 2014/13/B/ST8/04280 and 2016/23/N/ST8/03688.