

ACEX2019

*13th International Conference on Advanced Computational Engineering and Experimenting
ATHENS (Greece) from 1-5 July, 2019*

The Correlation Between Corrosion Control of Biodegradable Alloys and The Possible Achievement of an Approved Magnesium Product

A.Eliezer

Shamoon College of Engineering, Beer-Sheva, 84100, Israel

Introduction

Over the past 25 years magnesium science and engineering has produced dozens of thousands publications, thousands of active scientist and engineers, thousands of research and industrial cooperation's as well as hundreds of small companies.

Once all is being said the major question is why only a few companies have succeeded to achieve a magnesium product on the market? The global orthopaedics market was valued at \$52. Billion USD in 2017. For example the orthopedic area market which could fit magnesium alloys is evaluated for at approximately 6 billion USD per year. A major progress has been developed within the orthopedic surgery [1] which has helped to improve the quality of life. Approximately 4.5 million procedures related to joint replacement and fracture repair are performed worldwide each year. However, serious complications still occur mostly due to implant loosening or infection. For magnesium alloys the latest path from the idea to an implant product on the market may take between 4-8 years or more. Such achievement should also cost an average of 2-12 Million USD which may even increase due to the CE Mark and FDA restrictions for medical devices. Therefore entrepreneurship and innovative skills are required as its becoming not only a scientific issue but also a major business aspect. One of the major advantages of magnesium alloys is its relative high degradation rate but on the other hand such could also act as a major disadvantage.

Therefore surface treatments [2] , production processes and coatings have been major research axes to address those problems.

The major question of the study refers to the fact that up to date it is very difficult to estimate or define the correlation of corrosion behavior between the human body-scale to the laboratory scale. Another concern is should we consider the human body as an electrochemical cell? or can we rely on an electrochemical software for developing biomedical applications?

The lecture will focus on the path to achieve a magnesium biomedical implant from its starting point, the in-vitro-in-vivo and to the ending point, achieving a product on the market. The study will present a dedicated approach to identify and construct suitable traumatological implants made of magnesium alloys taking into account a suitable manufacturing process on an industrial scale.

References

- [1] A. Eliezer, F. Witte, "Corrosion behavior of magnesium alloys in biomedical environments" Journal of Advanced Materials Research, Vol. 95, 17-22. (2010).
- [2] C. Gasqueres, G. Schneider, R. Nusko, G. Maier, E. Dingeldein, A. Eliezer, " Innovative antibacterial coating by anodic spark deposition", Journal of Surface & Coatings Technology, 206 (2012), 3410-3414