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Mahmoud Z. Ibrahim, Ahmed A.D. Sarhan, Farazila Yusuf, M. Hamdi



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# Biomedical materials and techniques to improve the tribological, mechanical and biomedical properties of orthopedic implants – A review article

Mahmoud Z. Ibrahim<sup>a</sup>, Ahmed A.D. Sarhan<sup>b\*</sup>, Farazila Yusuf<sup>c\*</sup>, M. Hamdi<sup>d</sup>

<sup>a,c,d</sup> Centre of Advanced Manufacturing and Material Processing, Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

<sup>a</sup> Department of Mechanical Engineering, Faculty of Engineering, Ain Shams University, Cairo 11566, Egypt

<sup>b</sup> Mechanical Engineering Department, King Fahd University of Petroleum and Minerals, Dhahran 31261, Saudi Arabia

<sup>b</sup> Department of Mechanical Engineering, Faculty of Engineering, Assiut University, Assiut 71516, Egypt

\* Corresponding Authors

1- Ahmed A. D. Sarhan, E-mail: ahsarhan@kfupm.edu.sa, TEL: +966138602547, FAX: +966138602949

2- Farazila Yusuf, E-mail: farazila@um.edu.my, TEL: +603-7967-7633, FAX: +603-7967-5317

## Abstract

Recently, there has been an increasing trend in researches focusing on improving the performance of the biomedical implants. The clinicians used metallic implants to treat bone imperfections and fractures. The commonly used metals (Stainless steel, Ti-alloys and Co-alloy) failed to prove long-term durability and did not build sufficient bond with human bone. Since the invention of bioactive materials, which can generate chemical bond with bones, the researchers proposed combining the superior mechanical properties of metal and bioactivity of bioactive materials. This can be achieved by cladding bioactive material on metallic substrate. Different techniques, like thermal spraying, electron magnetron sputtering, laser cladding, etc., were proposed to successfully deposit bioactive materials on metallic substrates. In this article, we will discuss the potential of available metallic alloys and bioactive materials in biomedical implants including different techniques used in depositing bioactive materials on metallic implants.

Keywords: biocompatible metals, Bulk Metallic Glass alloys, bioactivity, coating techniques, Bioglass, Hydroxyapatite

## 1. Introduction

The development of medical implants is of great importance to treat bone fractures and deficiencies. The need for implants increased dramatically in the past 5 years (the number of revision hip surgery increased by 26% and is predicted to reach 137% in 2030) [1]. This increasing need lead to more focus on developing more durable implants. Until now, there is no record of successful long-term implantation of metallic device in human body. In the past, the used materials were silver and gold which are believed as bioinert materials, but they are expensive and exhibit poor mechanical properties. After Lister introduced his aseptic surgical technique, the metallic alloys have been developed to be used in medical implants [2]. The metallic alloys find wider applications in medical implants than pure metals due to their enhanced mechanical properties and tribological properties

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