

## **A Review of Hydroxyapatite-Based Coating Techniques: Sol–Gel and Electrochemical Depositions on Biocompatible Metals**

*R.I.M. Asri<sup>a</sup>, W.S.W. Harun<sup>b</sup>, M.A. Hassan<sup>b</sup>, S.A.C. Ghani<sup>b</sup>, Z. Buyong<sup>c</sup>*

<sup>a</sup>Institute of Postgraduate Studies, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

<sup>b</sup>Human Engineering Group, Faculty of Mechanical Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

<sup>c</sup>Kuliyah of Medicine, International Islamic University Malaysia, 25200 Kuantan, Pahang, Malaysia

### **ABSTRACT**

New promising techniques for depositing biocompatible hydroxyapatite-based coatings on biocompatible metal substrates for biomedical applications have continuously been exploited for more than two decades. Currently, various experimental deposition processes have been employed. In this review, the two most frequently used deposition processes will be discussed: a sol–gel dip coating and an electrochemical deposition. This study deliberates the surface morphologies and chemical composition, mechanical performance and biological responses of sol–gel dip coating as well as the electrochemical deposition for two different sample conditions, with and without coating. The review shows that sol–gel dip coatings and electrochemical deposition were able to obtain the uniform and homogeneous coating thickness and high adherent biocompatible coatings even in complex shapes. It has been accepted that both coating techniques improve bone strength and initial osseointegration rate. The main advantages and limitations of those techniques of hydroxyapatite-based coatings are presented. Furthermore, the most significant challenges and critical issues are also highlighted.

**KEYWORDS:** Biomaterials; Hydroxyapatite coating; Electrodeposition; Sol–gel dip Coating

**DOI:** [10.1016/j.imbbm.2015.11.031](https://doi.org/10.1016/j.imbbm.2015.11.031)