A comprehensive review of hydroxyapatite-based coatings adhesion on metallic biomaterials

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ABSTRACT

Metallic biomaterials have been employed in replacing and reconstructing the structural parts of the human physical structure due to their high mechanical properties, superior biocompatibility, and high corrosion re-sistance. The most common metallic biomaterials that have been used in implants include magnesium, stainless steel, cobalt-based alloy, titanium, and titanium-based alloy. Hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$) is one of the ceramic biomaterials considered as ideal materials for coating on metallic biomaterials as it possesses almost the closest similarity in chemical composition and excellent biocompatibility with natural bone tissue. Recently, the HAp-based coating has increasingly drawn attention to improve the adhesion quality in metallic biomaterials. This study comprehensively reviews the current progress in the adhesion qualities of HAp-based coatings on metallic biomaterials specifically for the biomedical application. It has been observed that a surface that meets the minimum unique characteristics will enhance the bonding force between the coating and metallic bioma-terial as the substrate. Critical factors of coating/substrate materials, coating techniques, and coating thickness that determine the adhesion quality are thoroughly identified and discussed. The surface structure and micro-structure of HAp-based coating are also reviewed to confirm the findings.

KEYWORDS: Adhesion strength; Hydroxyapatite; Coating; Metallic biomaterials; Powder

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