Corrosion and surface modification on biocompatible metals: A review

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ABSTRACT

Corrosion prevention in biomaterials has become crucial particularly to overcome inflammation and allergic reactions caused by the biomaterials' implants towards the human body. When these metal implants contacted with fluidic environments such as bloodstream and tissue of the body, most of them became mutually highly antagonistic and subsequently promotes corrosion. Biocompatible implants are typically made up of metallic, ceramic, composite and polymers. The present paper specifically focuses on biocompatible metals which favorably used as implants such as 316L stainless steel, cobalt-chromium-molybdenum, pure titanium and titanium-based alloys. This article also takes a close look at the effect of corrosion towards the implant and human body and the mechanism to improve it. Due to this corrosion delinquent, several surface modification techniques have been used to improve the corrosion behavior of biocompatible metals such as deposition of the coating, development of passivation oxide layer and ion beam surface modification. Apart from that, surface texturing methods such as plasma spraying, chemical etching, blasting, electropolishing, and laser treatment which used to improve corrosion behavior are also discussed in detail. Introduction of surface modifications to biocompatible metals is considered as a "best solution" so far to enhanced corrosion resistance performance; besides achieving superior biocompatibility and promoting osseointegration of biocompatible metals and alloys.