

Corrosion Behavior of Metallic Biomaterials Used in Living Body Environment

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Keywords: Biomaterials, Body environment, Biosafety, Biocompatibility

One of the major problems associated with the use of metallic biomaterials is their corrosion. In the case of metallic biomaterials, corrosion reactions, which are unavoidable in metals, cause not only deterioration or fracture of the products but also serious harm to living tissue. Nevertheless, metallic biomaterials are commonly used in the fields of medicine and dentistry because of their superior mechanical properties: an excellent combination of strength and ductility, resulting in high fracture toughness can not be substituted by other materials. Therefore, highly corrosion-resistant metals and alloys such as Ti, Ti alloys, Co-Cr alloys, and stainless steels are used for implant devices. All of them show superior corrosion resistance results from the formation of a passive film on the surface of the metal. However, very small quantities of the metallic ions actually dissolve through the passive film on these metallic biomaterials. There are already many literatures about the corrosion resistance of metallic biomaterials about the breakdown of the passive film. However, very limited information is available concerning the corrosion rate and the change in the amount of the released metallic ions as a result of the slight corrosion reaction with stable passive film. Therefore, author has studied for investigation of metallic biomaterials. In this presentation, the experimental results by several corrosion tests and surface analyses will be introduced. The long-term corrosion monitoring method by electrochemical impedance spectroscopy, the specific corrosion behavior of zirconium and its alloys in chloride-containing solution, and the drastic change in corrosion resistance of metallic biomaterials fabricated additive manufacturing process will be reviewed.