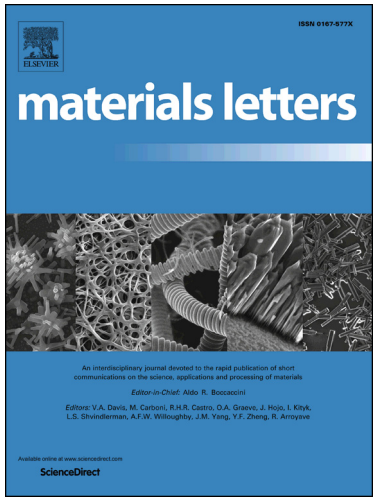

Incorporation of antibacterial ions on the micro/nanostructured surface and its effects on the corrosion behavior of titanium

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Incorporation of antibacterial ions on the micro/nanostructured surface and its effects on the corrosion behavior of titanium

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Abstract

The hierarchical micro/nanostructure has been proved to improve the integration of an implant and its surrounding bone tissue. However, excellent antibacterial properties and good corrosion resistance are also important to increase the success rates of implants. Therefore, in this paper, the micro/nanostructure containing antibacterial ions (silver, copper and zinc ions) was fabricated on the surface of titanium by the combination of sandblasting, acid etching, alkali-heat treatment, and ion exchange. And the corrosion resistance was evaluated by polarization curve test. The results demonstrated that the more active metal ions on the surface of micro/nanostructured titanium were, the worse the corrosion resistance was. Nevertheless, compared to polished titanium, the corrosion current of micro/nanostructured titanium with antibacterial ions was increased due to the effect of surface topography and chemical composition. This study provides a promising insight into the antimicrobial design of titanium surfaces in the future.

Keywords: Biomaterials; Structural; Antibacterial ions; Corrosion resistance

1. Introduction

Titanium (Ti) and its alloys have been widely utilized in the field of orthopedics and dentistry due to their good mechanics, excellent biocompatibility and lower cost [1-3]. However, implant failures caused by lack of local bone tissue integration and implant-associated bacterial infections still occurred frequently [2]. To improve the success rates of implants, researchers have made many attempts in the past. On one hand, the micro/nanostructure was fabricated on Ti surface by various methods to mimic the structures of natural bone for enhancing the responses of cells to an implant [3-5]. On the other hand, antimicrobial substances were incorporated on the surface of Ti for reducing bacterial infections [1, 2, 6]. Therefore, incorporation of antibacterial substances on micro/nanostructured Ti surface may be an effective method