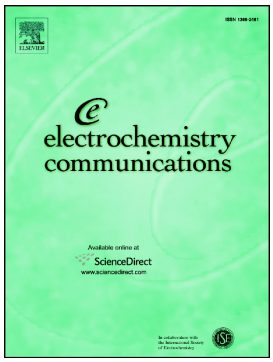

Potentiometric scanning electrochemical microscopy for monitoring the pH distribution during the self-healing of passive titanium dioxide layer on titanium dental root implant exposed to physiological buffered (PBS) medium

Abdelilah Asserghine, Dániel Filotás, Bálint Németh, Lívia Nagy, Géza Nagy

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Potentiometric scanning electrochemical microscopy for monitoring the pH distribution during the self-healing of passive titanium dioxide layer on titanium dental root implant exposed to physiological buffered (PBS) medium

Abdelilah Asserghine[a], Dániel Filotás[a], Bálint Németh[c], Lívia Nagy[a,b], Géza Nagy[a,b]

[a] *Department of General and Physical Chemistry, Faculty of Sciences, University of Pécs, 7624, Ifjúság u. 6. Pécs, Hungary*

[b] *János Szentágothai Research Center, University of Pécs, 7624, Ifjúság u. 20. Pécs, Hungary*

[c] *BL Dent Kft. 1027 Budapest, Kapás utca 26-44.*

g-nagy@gamma.ttk.pte.hu

Abstract

Spontaneously forming oxide film protects titanium containing medical implants against corrosion and it also mitigates the release of poisonous ionic species into the surrounding life tissues. The self-healing kinetics of the film that lost integrity upon some impact is an important feature. In this short paper, the recent results obtained investigating the formation of the oxide film using potentiometric SECM and electrochemical impedance spectroscopy is presented. Ti G4 dental root implant was used as sample surface immersed in PBS medium. SECM in potentiometric mode, using antimony microprobe was applied to monitor the pH change in different times over freshly polished G4 titanium by recording a series of consecutive line scans, to find out the mechanism of TiO_2 formation. Impedance spectroscopic experiments were carried out to investigate how the corrosion resistance of freshly polished titanium G4 surface changes by the exposition time.

Key words

Ti G4 dental implant, SECM, Self-healing TiO_2 formation, Antimony microelectrode, Kinetics of TiO_2 formation.

1. Introduction

Owing to their exceptionally good anticorrosion character, mechanic strength, strength-to-weight ratio, as well as being non-magnetic [1- 4], titanium and its alloys are used in broad scale in different areas where long life, lightweight but strong structures are needed. Health care is one of the most rapidly expanding application fields of them since they are biocompatible and can form an intimate bond to human bones [5]. Surgical instruments,