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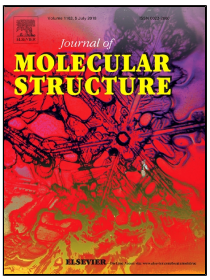

Examination of doped zirconia-based layers deposited on metallic substrates

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Examination of doped zirconia-based layers deposited on metallic substrates

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Abstract:

The work was focused on the spectroscopic examination of zirconia-based layers deposited on metallic substrates. Metallic biomaterials belong to the group of well-known and most widely applied materials in medicine. They might be characterised by the easiness of formation and good mechanical properties. However, the surface properties of the material need to be strictly controlled to prevent corrosion processes and ensure biocompatibility. One of the modifications leading to improvement of the properties important in terms of considering the material for biomedical applications was the fabrication of ceramic layers on the surface.

Presented zirconia-based layers doped with calcium and hydroxyapatite were obtained using the sol-gel method and deposited on the metallic (titanium and steel) surface with the use of dip-coating technique and electrophoretic deposition (EPD) method. Obtained layers were examined with multiple spectroscopic and microscopic methods such as Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), energy dispersive spectroscopy (EDS), scanning electron microscopy (SEM) and atomic force microscopy (AFM). Also the surface properties – wettability and surface free energy (SFE) – were measured. Bioactivity of the obtained layers was evaluated by the in vitro test in simulated body fluid (SBF) - the so-called Kokubo test.

Keywords: biomaterial; bioactivity; ceramic coatings; sol-gel; EDP.

Introduction

Metallic biomaterials are one of the most commonly used materials in medicine. In view of their character, they must meet certain conditions [1]. First of all the tissue compatibility and biotolerance are key factors [2]. High quality and homogeneity are required as well as austenitic and paramagnetic structure [3]. Biomaterial must not induce thrombosis, which can occur when blood comes into contact with ferromagnetic [4]. Applied metals