

Polymeric monomolecular magnesium coatings for biomedical applications

Ch. Mayer, V. Zoulalian, S. Tosatti, N. Spencer

Laboratory for Surface Science and Technology, Department of Material Science, ETH Zurich, Switzerland

INTRODUCTION: A novel approach in biomedical implant research is related to metallic biocompatible materials, especially for stents. Materials, such as magnesium alloys, which corrode in an aqueous environment, have been recently developed for these applications [1]. At present the problem is the fast corrosion occurring with available materials. That is the reason why the further degradation behavior of these kinds of alloys has to be fine tuned by e.g. application of an organic overlayer [1].

Moreover, the control over non-specific adsorption of proteins, cells and microorganisms to surfaces is crucial in biomedical implant research, because that can reduce drastically inflammatory reactions, foreign-body responses, failure and rejection of the implants and therefore improve the time performance of the medical device [2].

METHODS: In order to combine both requirements, a novel polymeric coating for magnesium substrates in bio-medical applications has been conceived. The controlled degradation of the substrate as well as the change of interface properties towards a non-fouling surface, preventing non-specific protein adsorption are peculiarities of this novel platform.

RESULTS: A first generation of functional polymers (c.f. Fig.1) has been synthesized by terpolymerization of functional monomers by chain-transfer polymerization to limit the degree of polymerization and propagation [3].

The surface activity has been tested by deposition from aqueous solution onto titanium dioxide as model substrate. Protein resistance has been proven with the aid of XPS and VASE [3].

First deposition experiments have been investigated for WE43 magnesium alloy substrate. Due to the redox degradation of magnesium in contact with aqueous solutions, a new deposition protocol from polar, organic solvents has to be investigated.

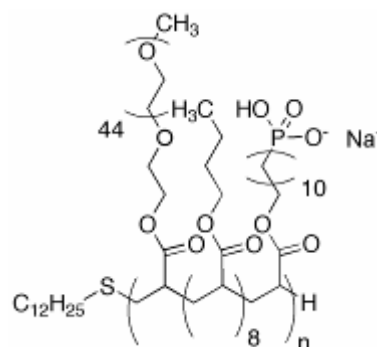


Fig. 1: Structure of poly(alkyl-phosphonates)

Deposition from isopropanol has shown surface activity, but no protein resistance has been obtained yet.

CONCLUSIONS: The polymer of Fig.1 has shown surface activity and protein resistance on titanium dioxide as model substrate. For further surface deposition and characterization on magnesium substrates, a new deposition procedure out of polar, organic solvents has to be developed first.

REFERENCES:

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