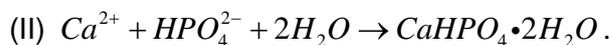
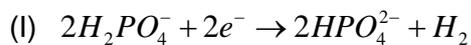


# Masterarbeit

## Electrochemical characterization of magnesium surface for application as implant material

Magnesium (Mg) is a unique biodegradable metal which possesses mechanical properties similar to that of natural bones and in the last years became attractive material to be used as orthopedic implants. In addition, Mg is not toxic to the human body and the dissolution of Mg is not likely to cause any side effects. However, the quick corrosion rate restricts its wide clinical applications. Modifications of the Mg surface by biocompatible protective coatings aim at a reduction of the implant biodegradation rate. Coatings with calcium phosphate compounds attract large scientific attention. Interestingly, CaHPO<sub>4</sub> may be deposited electrochemically. The electrodeposition reaction involves two following steps [1].



In this work, electrochemical properties of Mg and CaHPO<sub>4</sub> modified Mg model implant materials will be studied at room and body temperatures. The calcium phosphate layer will be electrodeposited on the Mg surface as described recently in [1]. Cyclic voltammetry, alternative current voltammetry and chornocoulometry will be used to find the potential window in which both electrodes are stable, the capacitance of the electrodes, and electrochemical reactions involved in the biodegradation of the electrode material. Infrared reflection absorption spectroscopy (IRRAS) will be used to study the chemical composition of the adsorbed calcium phosphate layer.

Finally, the adsorption of collagen, the most important protein from the extracellular matrix, will be studied. The electrochemical properties of the protein modified electrode will be investigated in order to find potentials at which the adsorption of biomolecules on the model implant materials takes place. IRRAS will be employed to detect the adsorbed protein and obtain information concerning the structure of the adsorbed collagen molecules.

### References:

- [1] B. Hadzima, M. Mhaede, F. Pastorek, *Journal of Material Science* **2014**, 25, 1227.

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