EFFECTS OF ANODIZATION PARAMETERS ON PHYSICOCHEMICAL PROPERTIES OF THE OXIDE COATINGS ON MAGNESIUM

Yevheniia Husak[1,2*], Agnieszka Ossowska[3], Viktoriia Korniienko[2,4], Anna Yanovska[2], Maksym Pogorielov[2,4], Wojciech Simka[1]

[1]Silesian University of Technology, Gliwice, Poland
[2]Sumy State University, Sumy, Ukraine
[3]Gdansk University of Technology, Gdansk, Poland
[4]University of Latvia, Riga, Latvia
*e-mail: yevheniia.husak@polsl.pl, e.gusak@med.sumdu.edu.ua

Abstract:

Application of Mg-based biodegradable surgical and orthopedics implants require enhancing of their corrosion resistance. Plasma electrolytic oxidation (PEO) is a one of most advanced ways for developing of ceramic oxide coating on Mg and its alloys with anticorrosive, biocompatible, and bioactive properties. These investigations aimed to optimize PEO process parameters, including voltage and chemical composition of an electrolyte to obtain an appropriate coating on pure Mg.

The electrolyte was composed of 10 g/L NaOH, 5 g/L NH_4F and Na_2SiO_3 - 10 g/L, 20 g/L, 30 g/L. The effect of voltage and sodium silicate concentration on the coatings was observed by scanning electron microscopy (SEM), X-ray microanalysis (EDX), wettability, and roughness measurements.

During the PEO, a coating with rough and nano-porous structure with an average pore size up to 0.034 μm was formed. Increasing of the silicate concentration promotes significant increase of the pore size. The thickness and the roughness of the obtained layers significantly increased by increasing voltage up to 225V. The amount of incorporated Si and F into the coating is affected by voltage. All surfaces have stable hydrophilic properties.

Acording to the obtained results the most suitable coatings for biomedical investigation were obtained in 20 g/L Na_2SiO_3 solution, at 200V and 225V.

Yevheniia Husak - a PhD student at Silesian University of Technology (Poland) and Sumy State University (Ukraine). My research activity allowed me to publish 33 co-authored papers (h-index - 8), 11 - with the IF over 3. I have experience in bone tissue regeneration, and some projects I was an involved deal with dental, orthopedic implants surface modification made from Ti and its alloy. My PhD project is structured around the creation of porous ceramic coatings on Mg with biocompatible features.