DEVELOPMENT OF ZINC-NICKEL 3D STRUCTURE ON TITANIUM PLATE FOR HYDROGEN PEROXIDE REDUCTION REACTION

A. Antanaitis*, A. Balčiūnaitė, L. Tamašauskaitė-Tamašiūnaitė, E. Norkus

Department of Catalysis, Center for Physical Sciences and Technology, Vilnius, Lithuania
* augustas.antanaitis9@gmail.com

Zinc-nickel 3D coatings were made on a titanium plate (ZnNi/Ti) by electrochemical deposition from a solution that contained 0.4 M $Zn(NO_3)_2$ and 2 M $NiSO_4$. Electroplating was performed under different time and current density conditions: 1) 500 $mAcm^{-2}$ for 1 min; 2) 50 $mAcm^{-2}$ for 1 min and 500 $mAcm^{-2}$ for 5 min; 3) 50 $mAcm^{-2}$ for 1.5 min, 250 $mAcm^{-2}$ for 1.5 min and 500 $mAcm^{-2}$ for 2 min. Coating surface and combination of chemical elements were inspected using scanning electron microscopy, energy-dispersive X-ray spectroscopy, X-ray diffraction, and inductively coupled plasma optical emission spectroscopy. To compare and evaluate the electrocatalytic activity of the coated electrodes for the hydrogen peroxide reduction reaction, a cyclic voltammetry method was used. The cyclic voltammograms were recorded in a 0.1 M KOH and 0.05 M H_2O_2 solution at a potential scan rate of 10 mV s^{-1} in a potential range from -0.8 to 0.2 V vs. Ag/AgCl at a temperature of 25 °C. The highest electroactivity for hydrogen peroxide reduction reaction was achieved with ZnNi/Ti coating, consisting of 45 at. % of Zn and 55 at. % of Ni.

Acknowledgment. This project has received funding from European Social Fund (project No 09.3.3-LMT-K-712-19-0138) under grant agreement with the Research Council of Lithuania (LMTLT).