5TH REGIONAL SYMPOSIUM ON ELECTROCHEMISTRY SOUTH EAST EUROPE

PROGRAM

BOOK OF ABSTRACTS

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Controlled Colloidal Synthesis and Basic Electrochemical Properties of TiO_2-Supported Pt

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TiO_2 was synthesized by forced hydrolysis process in order to be used as the support for Pt electrocatalyst (Pt/TiO_2). Pt was deposited from Pt colloid solution synthesized by microwave-assisted polyol process. TiO_2 powder (or C) was dispersed into H_2O and 2 M H_2SO_4. The obtained suspension was stirred and Pt colloid was added afterwards. Upon filtration and rinsing with water, the obtained Pt/TiO_2 (or Pt/C) catalyst was thermally treated at 160 °C in N_2 atmosphere. The catalyst water suspension for the preparation of 0.31 mg/cm^2 thin layer electrode was loaded onto glassy carbon disk. Physical and chemical properties of the TiO_2 and supported Pt catalyst were characterized by EDS, SEM, dynamic light scattering and XRD techniques. The influence of TiO_2 thermal treatment on the electrochemical properties of Pt/TiO_2 was also checked. Nominal Pt loading was 20 wt. %. EDS method revealed 18 wt. % loading of Pt on TiO_2. The electrochemical properties of the Pt/TiO_2 were examined by cyclic voltammetry in 0.1 M $HClO_4$. The obtained results were compared with those obtained for carbon-supported Pt under the same conditions (Figure 1). The charge corresponding to the hydrogen desorption on Pt/TiO_2 is lower than expected for 20 wt. % Pt. Although the voltammetric response is typical for Pt-based electrode material, the charge corresponds only to ~3 wt. % Pt. SEM images showed that TiO_2 particles tend to form 3μm-sized agglomerates of ellipsoidal shape. The results indicate the possibility for platinum particles to be trapped inside TiO_2 agglomerates. Even though calcination of TiO_2 improved the Pt uptake from colloidal dispersion, it is still not as effective as commercial carbon support.

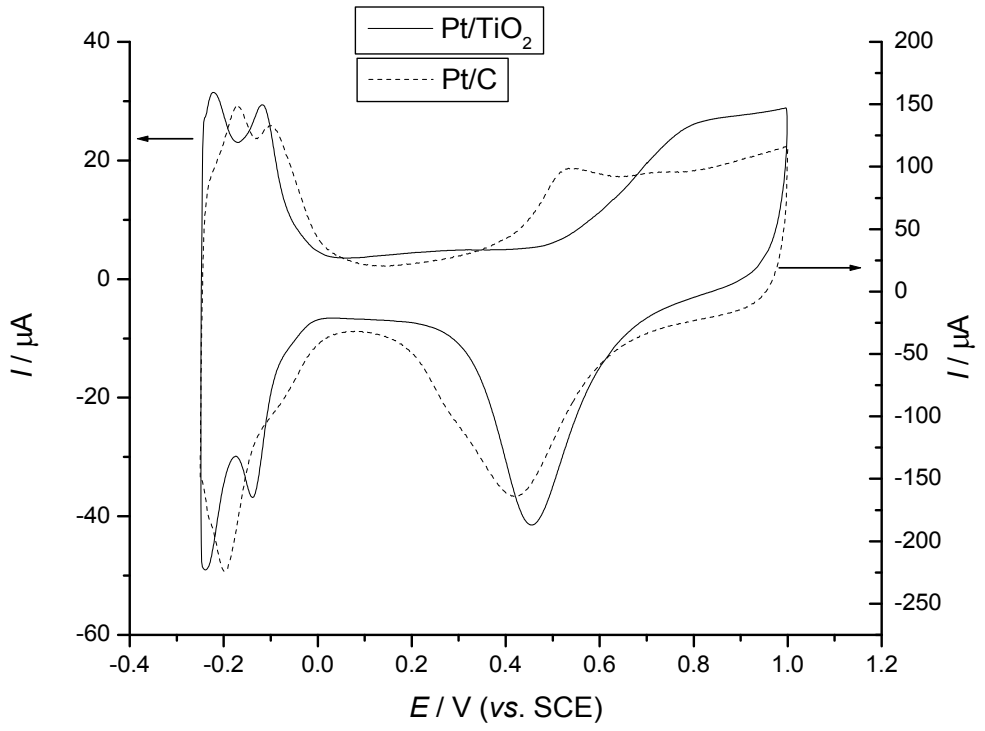

Figure 1. Cyclic voltammograms of Pt supported on thermally treated TiO_2 and Pt/C in deaerated 0.1 M $HClO_4$, sweep rate 50 mV s^{-1}.