

Title: Study of new catalytic materials for proton exchange membrane fuel cells

Author: Petr Homola

Department: Department of Surface and Plasma Science

Supervisor: Prof. RNDr. Vladimír Matolín, DrSc.

Abstract: Submitted thesis deals with study of thin layers based on platinum and cerium oxides in order to use them in fuel cells with polymer membrane (PEMFC). A set of samples with different amount of platinum was prepared by means of magnetron sputtering. Samples were investigated by X - ray Photoelectron Spectroscopy (XPS) and results were confronted with sputtering parameters. It was found out that chemical state of platinum is related to its amount in thin layer. The less platinum was contained in thin layer, the less amount of Pt⁰ state was observed and amounts of Pt²⁺ and Pt⁴⁺ states increased. Furthermore the temperature stability of prepared layers in the interval from room temperature to 250 °C was studied by means of XPS. The adsorption of carbon monoxide was measured by infrared absorption spectroscopy (IRAS). Increasing degree of adsorption on sample probably related to platinum reduction with increased temperature was observed. Measurements of other samples were devaluated by strong contamination with nickel carbonyls.

Keywords: PEMFC, cerium oxide, magnetron sputtering, XPS, CO adsorption