

SYNTHESIS OF CARBON SUPPORTED GOLD NANOPARTICLES FOR ETHANOL ELECTRO-OXIDATION

Daina Upskuvienė, Aldona Balčiūnaitė, Algirdas Selskis, Loreta Tamašauskaitė-Tamašiūnaitė, Eugenijus Norkus

Department of Catalysis, Center for Physical Sciences and Technology
Saulėtekio Ave. 3, LT-10257, Vilnius, Lithuania
e-mail.: daina.upskuviene@ftmc.lt

The development and investigation of various materials used in fuel cells is a major challenge in the scientific community. Literature describes many various supports, metals, methods, which are able to enhance the electrocatalytic activity of the new created catalysts. The nano-sized gold nanoparticles (GNPs) have been known from the very beginning of human civilization, but systematic scientific investigations were performed much later. The methods to synthesize, efficiently, metallic nanoparticles are becoming more widespread. In this area, the challenges are to use low-cost methods with low-toxicity substances as well as novel techniques to control nanoparticles size and shape. Recently, formation of new composites by adsorption of gold nanoparticles on carbon has attracted interest due to their physical properties and applications in catalysis, electrochemical energy storage or electrochemical sensors.

This work is focused on the preparation of gold nanoparticles (GNPs) using various halides, such as KCl, KBr, and KI as additives with the aim to use them as electrocatalysts towards the electro-oxidation of ethanol. GNPs were reduced from Au^{3+} (HAuCl_4) to Au^0 in an aqueous solution using glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) as a reducing agent. Further, the obtained GNPs were deposited on the surface of carbon powder using the adsorption method. The size, shape and composition of the prepared gold nanoparticles were detected by means of Field Emission Scanning Electron Microscopy (FESEM) and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).

It has been determined that, depending on the halides (KCl, KBr and KI), GNPs of ca. 20-90 nm in size were successively synthesized. The shape and size of the obtained Au nanoparticles are affected by halide ions. The electrocatalytic properties of the prepared GNPs, using various halides, towards the electro-oxidation of ethanol in an alkaline medium are compared and discussed on the basis of electrochemical data.