

N-Doped Wood-Derived Carbon Material Supported with Gold Nanoparticles as an Efficient Catalyst for Glucose Electro-Oxidation

Daina Upskuvienė¹, Aldona Balčiūnaitė¹, Jūratė Vaičiūnienė¹, Ivar Kruusenberg², Aleksandrs Volperts³, Galina Dobele³, Aivars Zurins³, Loreta Tamašauskaitė-Tamašiūnaitė¹, Eugenijus Norkus¹

¹*Department of Catalysis, Center for Physical Sciences and Technology, Saulėtekio Ave. 3, LT-10257, Vilnius, Lithuania*

²*National Institute of Chemical Physics and Biophysics, Akadeemias Tē 23, 12618, Tallinn, Estonia*

³*Latvian State Institute of Wood Chemistry, Dzerbenes Street 27, Riga LV-1006, Latvia*

Saulėtekio Ave. 3, LT-10257, Vilnius, Lithuania

e-mail.: daina.upskuviene@ftmc.lt

This study is focused on the preparation of gold nanoparticles (AuNPs) supported carbon (C) and nitrogen-doped activated carbon (N-doped C) nanocomposites and their application for the electro-oxidation of glucose and oxygen electro-reduction. The AuNPs/N-doped C nanocomposite was prepared by two-step process. At first, activated wood-based carbon was prepared from alder charcoal and doped with nitrogen by pyrolysing samples at a temperature of 800 °C in the presence of dicyandiamide (DCDA). Further, the AuNPs were deposited on the obtained N-doped activated carbon material or carbon using glucose and ascorbic acid as reducing agents. The prepared nanocomposites were characterized by scanning electron microscopy (SEM), energy-dispersive spectroscopy (EDS), X-ray powder diffraction (XRD), Raman and X-ray photoelectron spectroscopy (XPS). The electrocatalytic activity of the nanocomposites for oxygen electro-reduction and glucose electro-oxidation was investigated using the cyclic voltammetry and rotating disk electrode (RDE) methods.

It has been determined that the AuNPs/N-doped C and AuNPs/C nanocomposites had a higher catalytic activity for the electro-oxidation of glucose than the pure Au or carbon and N-doped carbon alone, indicating the synergistic effect of AuNPs and N-doped carbon or carbon. Moreover, the highest activity shows the AuNPs supported N-doped carbon as compared with that of AuNPs supported carbon.