O 12. ELECTROCHEMICAL CHARACTERIZATION OF PD-M (M: MN, ZN, V, CO) BIMETALLIC NANOPARTICLES FOR SENSOR APPLICATION

Hilal Kivrak[2], Burak Yapıcı[1], Ozlem Sahin[1]

[1] *Chemical Engineering Department, Selcuk University, Konya, 42079, Turkey*
[2] *Chemical Engineering Department, Yüzüncüyıl University, 65080 Van, Turkey*

E-mail: ozlem@selcuk.edu.tr

ABSTRACT: Bimetallic nanoparticles, formed by the combination of two different metals, are the multifunctional nanomaterials with applications in different fields. These nanoparticles have attracted great attention as compared to monometallic nanoparticles due to their enhanced properties. They show better stability, selectivity and catalytic activity over monometallic ones due to the synergistic effect that exists between two metals. Bimetallic nanoparticles can be synthesized in different shape, size and structure. To produce bimetallic nanoparticles with tunable and enhanced properties, different synthesis methods can be used. Researchers are trying to synthesize new materials with desired and controlled structure with different properties. These particles have excellent properties that they act as catalyst and help in effectively catalyzing various reactions. Those bimetallic nanoparticles can be used in different electrochemical sensors towards the enzymeless detection of many substrates. The replacement of enzymes with bimetallic catalysts, tuned to facilitate the direct electrocatalytic oxidation/reduction of substrate at a non-enzymatic electrode, prevents the necessity of using enzymes. They play diverse roles in improving the sensing performances, highly depended on their nanostructure and composition. Owing to their high sensitivity, selectivity, stability, fast response time, etc., these bimetallic nanoparticles modified electrodes can be used as sensors for detection of different substrates. Noble metals for preparing nanomaterials for non-enzymatic detection include Pt, Pd, Au, Ag, etc. Among these palladium is usually preferred to modify the electrodes due to its excellent electrocatalytic activity and low cost. In this study palladium based Pd-M (M: Mn, Zn, V, Co) bimetallic catalysts were prepared by NaBH4 reduction method. Electrochemical methods such as cyclic voltammetry, chronoamperometry and impedance spectroscopy were used to evaluate the electrocatalytic activities of the catalysts towards hydrogen peroxide detection (H2O2) oxidation/reduction reactions.

Keywords: Nanomaterials, bimetallic catalysts, non-enzymatic sensor, hydrogen peroxide detection