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Electrocatalytic properties of $CuCl_2$ or FeO doped polyaniline composites in electro hy-drogenation of aromatic nitro-compounds

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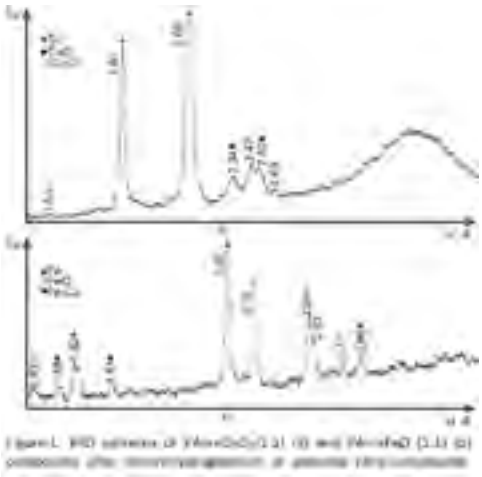
Metal-polymer composites on the base of conductive polymer polyaniline (PAni) have a number of practically valuable properties. In particular, they are actively used as cata-lysts in catalytic reactions and as electrode coatings in electrocatalytic systems. This pa-per presents the research results of the elec-trocatalytic activity of copper- and iron-containing PAni composites obtained by chemical methods in the processes of elec-trocatalytic hydrogenation of aromatic nitro-compounds, such as p-nitroaniline (p-NA) and p-nitrobenzoic acid (*p*-NBA). Copper- and iron-PAni composites were prepared by incorporating copper chloride (II) or iron ox-ide (FeO) in the reaction medium of oxida-tive polymerization of aniline (oxidizer - ammonium peroxydisulfate). The experi-ments on electrocatalytic hydrogenation were carried out in a diaphragm electrochemical cell in an alcohol–aqueous alkali catholyte. The anode was a Pt-gauze, the cathode was a Cu-plate, which closely contacted the bottom of the electrolyzer and served as a substrate for the PAni composite catalyst. The experi-ments were performed at a current of 1.5 A and a temperature of 30°C. By X-ray analysis it is determined that in the constitution of PAni+$CuCl_2$ composites synthesized with and without solvent evaporation procedure after applying them to activate the cathode in electrohydrogenation of p-NA there are the crystalline phases of Cu^0 and copper oxides (Figure 1, a). In the constitution of PAni+FeO composites after hydrogenation of p-NBA there are crystalline phases of Fe0, FeO and Fe_3O_4 (Figure 1, b). The appearance of copper and iron particles in zero-valence state in the composites indicates the passage of electrochemical reduction of metal cations from their compounds present in these com-posites before the hydrogenation processes. Exactly these metal particles have a catalytic effect on the electrohydrogenation of p-NA and p-NBA. In the case, the hydrogenation rates and conversion of hydrogenated com-pounds increase in comparison with their electrochemical reduction on Cu-cathode. The main products of electrocatalytic hydro-genation of *p*-NA and *p*-NBA on PAni com-*p*osites are the corresponding aromatic amino compounds.



Biography

Yakha A Vissurkhano is a Scientist working at the Institute of Organic Synthesis and Chem-istry of Coal, Kazakhstan Republic since 2012. She received her Master's degree in Natural Sciences in the year 2014. She completed her research work titled "Synthesis and physico-chemical studies of polymer-metal nanocomposites based on polyvinyl alcohol, polyaniline and 3d-metals" at Academician E A Buketov Karaganda State University, Kazakhstan. Her current research interests are focused on the synthesis of 3D-metal doped polyaniline compo-sites for hydrogenation of organic compounds. She has published more than 10 research pa-pers in various national and international journals.

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